

MANORAMA

YEAR BOOK 1986

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MANORAMA YEAR BOOK 1986

Twentyfirst Year
of Publication



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MANORAMA YEAR BOOK 1986

Twentyfirst Year of Publication

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PREFACE

We proudly present *Manorama Year Book 1986* to the reading public. This is the 21st year of its publication and appropriately enough, new chapters concerning the life and times of 21st century have been added.

The Year Book has been divided into Four Parts: 1. Science & Technology 2. World Panorama 3. India and States and 4. World of Sports. A unique feature of the present edition is the Four Special Features added to the Four Parts. This is in line with the internationally accepted pattern of Britannica Book of the Year. We hope to introduce new Special Features every year.

The internationally known physicist, Dr. E.C.G. Sudarsan has contributed the Special Feature, 'Beyond the Speed of Light' for Part One. The second special attraction, which also is the Cover Feature, is the most discussed topic of the decade, 'The Star Wars', written by an expert in the field, P.K.S. Namboodiri of the Institute of Defence Studies and Analyses, New Delhi.

India is in the throes of a Communication Revolution and hence the Special Feature in Part Three, 'Communication 21st Century', by a great authority in the field – M.A. Chowdappa, Director, Satellite, P & T.

World of Sports has a Special Feature – 'Boris Becker, the Tennis Prodigy'. Special mention of P.T. Usha, the Jewel in the Crown has also been made. And the highlights of this year's Seoul Asiad too.

Among the exhaustive new chapters are: Space Exploration, Test Tube Babies, AIDS and Cancer, Lasers: The Healing Beam, Classics: Old and New, Music and Communication, 40 years of the UN, The Geneva Summit, International Hotspots, Disasters, 100 year old Congress, The Year of Accords, New Economic Policy, The Seventh Plan, Atom For Peace, T.V's Jubilee Jump, New Direction For Education, Health For All, The Ganga Plan and Who's Who in India.

I am sure that the changes in the format and content of *Manorama Year Book 1986* would greatly benefit not only the general public but also those who appear for All India Examinations.

K.M.MATHEW
Chief Editor

SPLASH

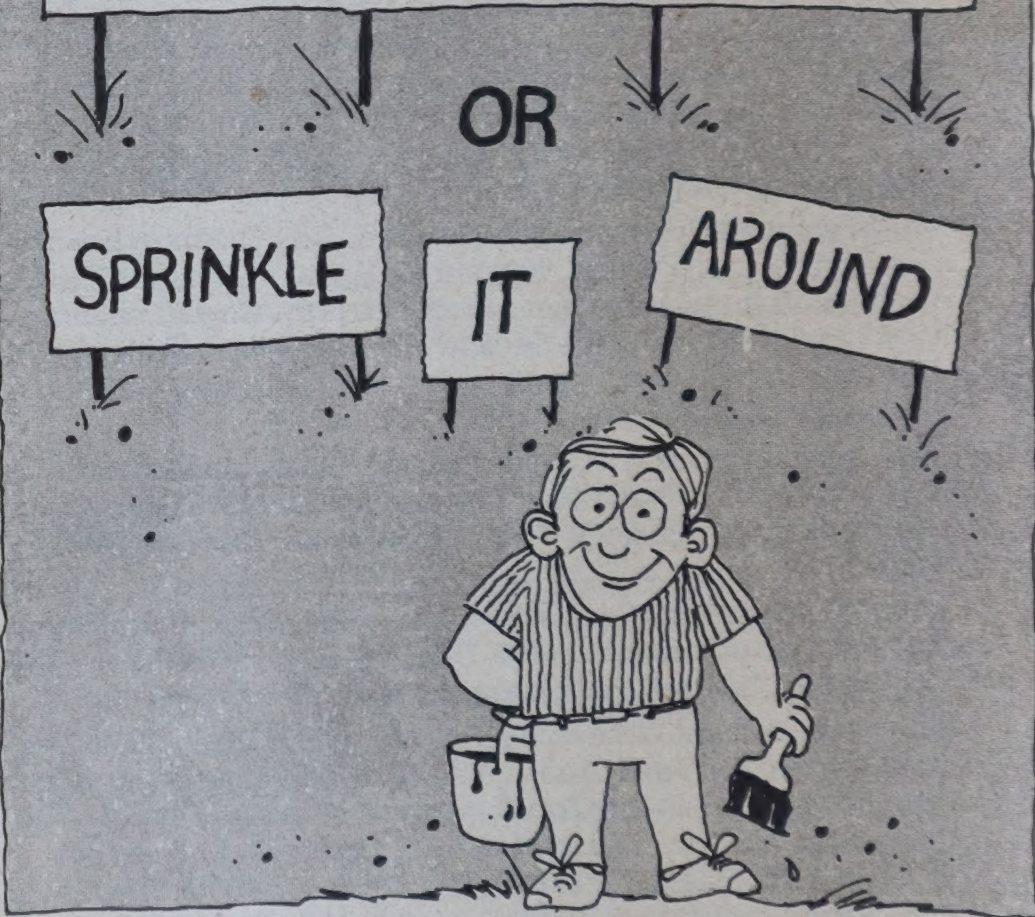
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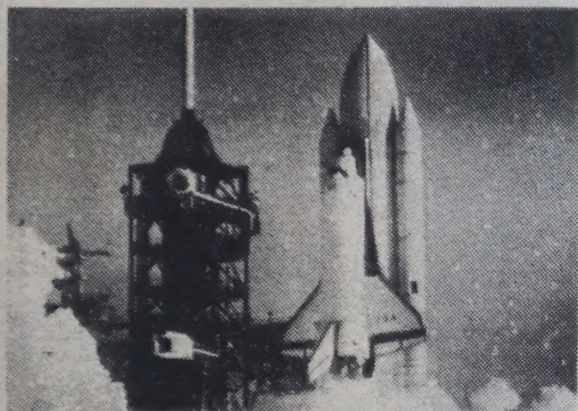
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CONTENTS

Part One Science & Technology



108 Is Space colony a distant dream? The story of Space till Challenger's tragic blast.



161 How are baby Louise Joy Brown, world's first test tube baby and her sisters?

Chap.	Page No.
1 THE UNIVERSE	66 - 68
2 OUTER SPACE	69 - 71
3 MODERN ASTRONOMY	71 - 76
4 THE WORLD OF SOUND	76 - 79
5 GALAXIES	79 - 81
6 THE MILKY WAY	82 - 83
7 STARS	83 - 84
8 MAGNITUDES	84 - 85
9 CONSTELLATIONS	86 - 86
10 LIFE OF A STAR	86 - 89
11 QUASARS	89 - 90
12 SOLAR SYSTEM	90 - 91
13 OTHER PLANETARY SYSTEMS	91 - 92
14 THE SUN	92 - 94
15 INNER PLANETS	94 - 96
16 OUTER PLANETS	97 - 100
17 THE MOON	101 - 103
18 COMETS	103 - 105
19 ASTEROIDS	105 - 107
20 METEORIDS	107 - 108
21 SPACE EXPLORATION	108 - 113
22 THE EARTH	113 - 115

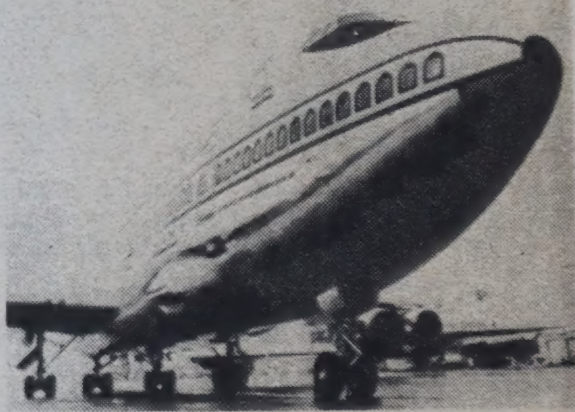
Chap.	Page No.
23 LITHOSPHERE	115 - 117
24 EARTHQUAKES	118 - 120
25 VOLCANOES	120 - 121
26 MOUNTAINS & DESERTS	121 - 122
27 ISLANDS	122 - 123
28 HYDROSPHERE	123 - 126
29 RIVERS, LAKES & FALLS	126 - 128
30 ATMOSPHERE	128 - 130
31 WIND BELTS	130 - 133
32 BIOSPHERE	133 - 136
33 ECOLOGY	136 - 141
34 EVOLUTION	141 - 143
35 DESCENT OF MAN	144 - 145
36 ETHNOLOGY	146 - 148
37 THE NEW BIOLOGY	148 - 153
38 GENES	153 - 155
39 PLASMIDS	155 - 157
40 RE-COMBINANT DNA	157 - 159
41 THE GENETIC CODE	159 - 161
42 TEST TUBE BABIES	161 - 163
43 FOOD & NUTRITION	163 - 169
44 LANDMARKS OF SCIENCE	169 - 176

45 INVENTIONS	176 - 179	50 INTERNATIONAL UNITS	187 - 192
46 ELEMENTS	179 - 182	51 THE WORLD OF MEDICINE	192 - 195
47 CRYOGENICS	182 - 184	52 AIDS & CANCER	195 - 200
48 TIME SYSTEMS	184 - 185	53 LASERS: THE HEALING BEAM	200 - 202
49 NUMERALS	186 - 186		
SPECIAL FEATURE: BEYOND THE SPEED OF LIGHT BY DR. E.C.G. SUDARSAN			203 - 206

Part Two World Panorama



296 Summit and after. Has the Geneva accord brought the East and the West closer?



377 Aviation's worst year with Air India jumbo plummeting into ocean depths.

Chap.	Page No.
54 PRE-HISTORY	208 - 210
55 FIRST GREAT CIVILIZATIONS	210 - 212
56 OUTLINE OF HISTORY	212 - 219
57 POST WORLD WARS	219 - 228
58 WONDERS OF THE WORLD	228 - 231
59 THE SUPERLATIVES	231 - 236
60 SOBRIQUETS	236 - 237
61 ABBREVIATIONS	237 - 242
62 MINERALS AND GEMS	242 - 246
63 OIL, COAL & FIREWOOD	246 - 250
64 RENEWABLE ENERGY	250 - 253
65 LANGUAGES	253 - 257
66 RELIGIONS	257 - 263
67 CLASSICAL WRITERS	263 - 265

Chap.	Page No.
68 CLASSICS: OLD & NEW	265 - 271
69 MUSIC AND COMMUNICATION	271 - 277
70 POPULATION EXPLOSION	277 - 281
71 40 YEARS OF UNITED NATIONS	282 - 288
72 WORLD ORGANISATIONS	289 - 294
73 NON-ALIGNED MOVEMENT	294 - 296
74 THE GENEVA SUMMIT	296 - 300
75 INTERNATIONAL HOTSPOTS	301 - 304
76 INDEPENDENT STATES	304 - 358
77 DEPENDENCIES	358 - 362
78 AWARDS AND HONOURS	362 - 377
79 DISASTERS	377 - 382

COVER FEATURE: STAR WARS - DEATH IN THE ORBIT
BY P.K.S. NAMBOODIRI

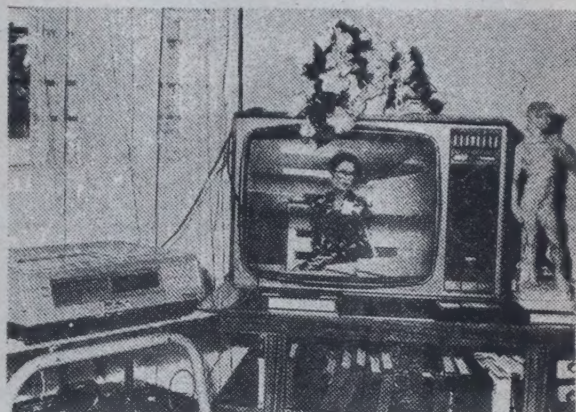
383 - 390

Part Three

India and States



477 It was a year of accords, but the embers are still there. An overview of Punjab, Assam.



567 Television's jubilee jump. The silver jubilee year has seen nearly five-fold growth.

Chap.	Page No.
80 THE GREAT CIVILIZATION	392 - 396
81 NATIONAL INSIGNIA	396 - 397
82 LANDMARKS OF HISTORY	397 - 400
83 NATIONAL MOVEMENT	400 - 403
84 100-YEAR-OLD CONGRESS	403 - 409
85 REPRESSION AND REFORM	409 - 413
86 PACTS AND CONFERENCES	413 - 417
87 THE PARTITION	417 - 419
88 FATHER OF THE NATION	419 - 421
89 FREEDOM AND AFTER	421 - 426
90 VICTORY AND MARTYRDOM	426 - 438
91 THE COUNTRY	438 - 441
92 FLORA AND FAUNA	441 - 443
93 CLIMATE AND RAINFALL	443 - 445
94 THE PEOPLE	445 - 446
95 THE POPULATION	446 - 451
96 RELIGIOUS COMMUNITIES	451 - 452
97 PRINCIPAL LANGUAGES	453 - 456
98 THE CONSTITUTION	456 - 462
99 THE AMENDMENTS	462 - 469
100 POLITICAL PARTIES	469 - 471
101 ELECTIONS	471 - 477

Chap.	Page No.
102 YEAR OF ACCORDS	477 - 482
103 NATIONAL ECONOMY	482 - 485
104 NEW ECONOMIC POLICY	485 - 492
105 THE SEVENTH PLAN	492 - 497
106 FIFTY YEARS OF RESERVE BANK	497 - 503
107 TRADE: THE WIDENING GAP	503 - 505
108 ENERGY	506 - 511
109 ATOM FOR PEACE	511 - 515
110 DEFENCE	515 - 520
111 INDUSTRIAL STRIDES	520 - 529
112 SECOND GREEN REVOLUTION	529 - 536
113 DEVELOPING RURAL INDIA	535 - 541
114 THE VANISHING FORESTS	541 - 545
115 OPERATION FLOOD	545 - 547
116 ASIA'S LARGEST RAILWAYS	547 - 551
117 ROADS AND WATERWAYS	551 - 555
118 SHIPPING IN ROUGH SEAS	555 - 559
119 AIR INDIA: JOY AND SHOCK	559 - 562
120 COMMUNICATION	562 - 567
121 TELEVISION'S JUBILEE JUMP	567 - 573
122 FILM: BURGEONING NUMBERS	573 - 579

123 GROWING PRINT MEDIA	579 - 583	128 TOURISM	
124 NEW PATH FOR EDUCATION	583 - 593	LARGEST EARNER	608 - 613
125 JOBS:		129 ENVIRONMENT:	
LENGTHENING QUEUE	593 - 600	GANGA PLAN	613 - 615
126 HEALTH FOR ALL	600 - 605	130 STATES & TERRITORIES	615 - 688
127 REACHING OUT TO SPACE	605 - 608	131 LOOKING BACK ON 1985	688 - 701
		132 WHO'S WHO IN INDIA	701 - 702
SPECIAL FEATURE: COMMUNICATION - 21ST CENTURY			
BY M.A. CHOWDAPPA, DIRECTOR,		703 - 712	
SATELLITE, P & T.			

Part Four World of Sports



718 Year of Asiad — Seoul is vibrant with dreams of Olympic blues

731 World Cup Football in Mexico. Is defending champion Italy on the way out?

Chap.	Page No.
133 OLYMPICS	714 - 718
134 ASIAN GAMES	718 - 720
135 COMMONWEALTH GAMES	720 - 721
136 SAF GAMES	721 - 721
137 NATIONAL GAMES	721 - 722
138 NATIONAL WOMEN'S SPORTS	723 - 723
139 NATIONAL SCHOOL GAMES	723 - 723
140 ATHLETICS	723 - 725
141 BADMINTON	725 - 725
142 BASKET BALL	726 - 726
143 BILLIARDS	727 - 727
144 BOAT RACE	727 - 727

Chap.	Page No.
145 BOXING	727 - 728
146 CHESS	728 - 728
147 CRICKET	728 - 731
148 FOOT BALL	731 - 734
149 GYMNASTICS	734 - 734
150 HANDBALL	734 - 734
151 HOCKEY	735 - 736
152 SQUASH	736 - 736
153 SWIMMING	736 - 739
154 TABLE TENNIS	739 - 741
155 TENNIS	741 - 745
156 VOLLEY BALL	745 - 745
157 WEIGHT LIFTING	745 - 747
158 WRESTLING	747 - 749
	751 - 753

SPECIAL FEATURE: BORIS BECKER: TENNIS PRODIGY

INDEX



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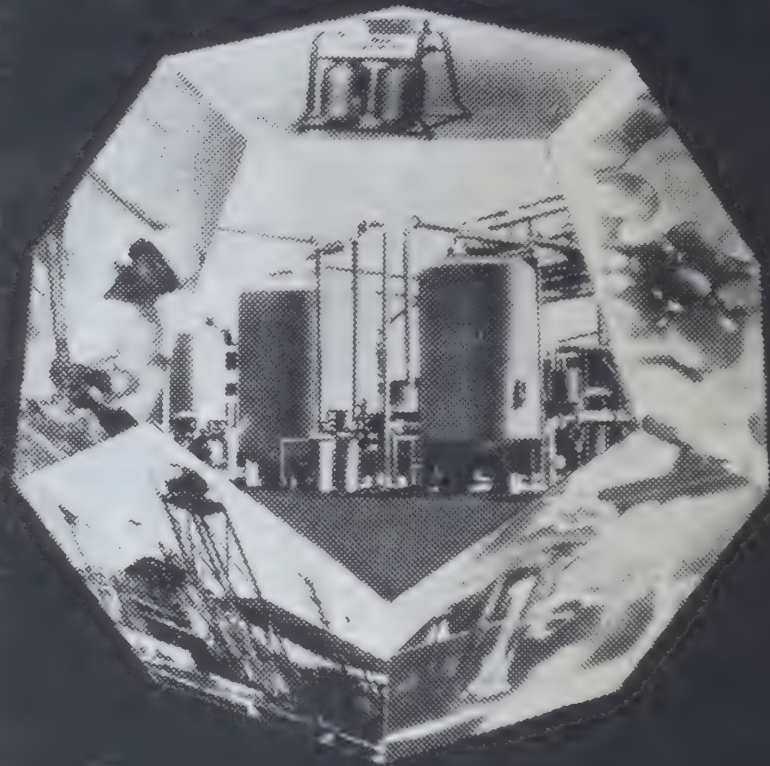
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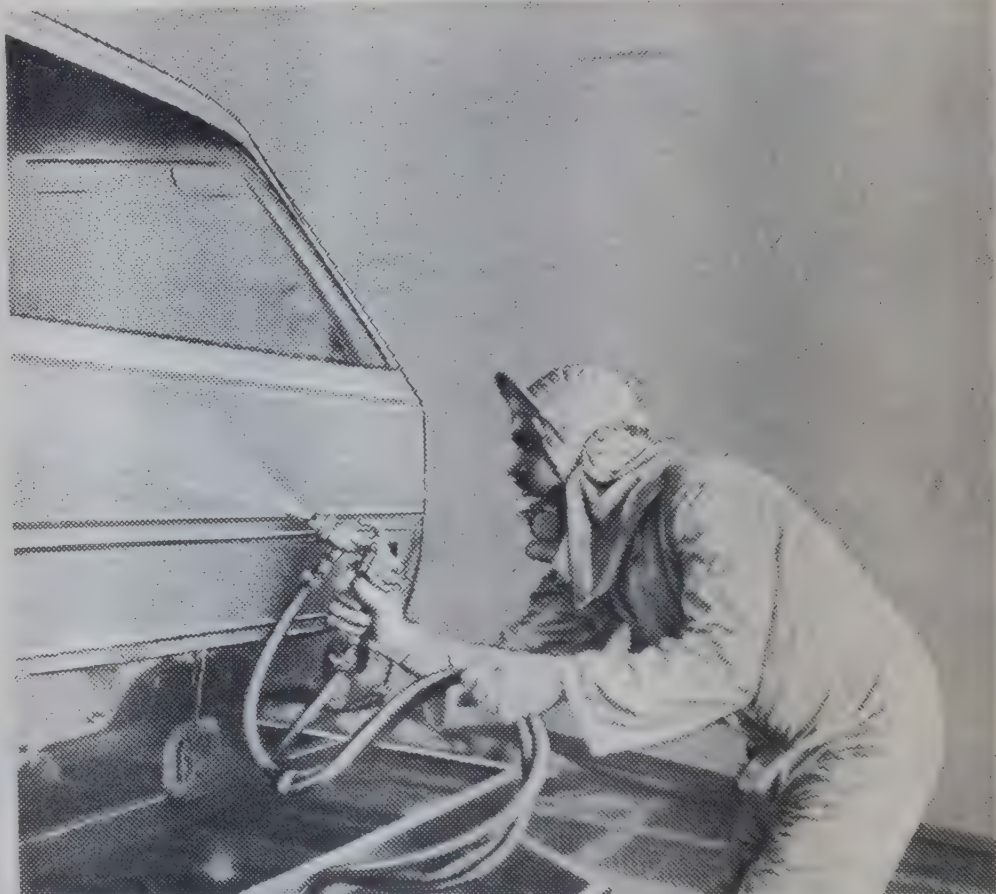
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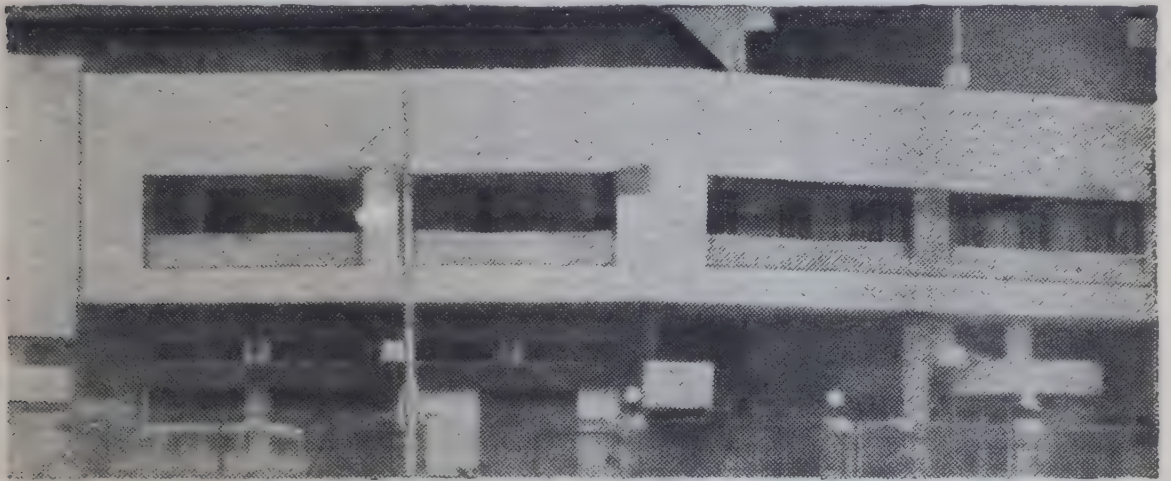
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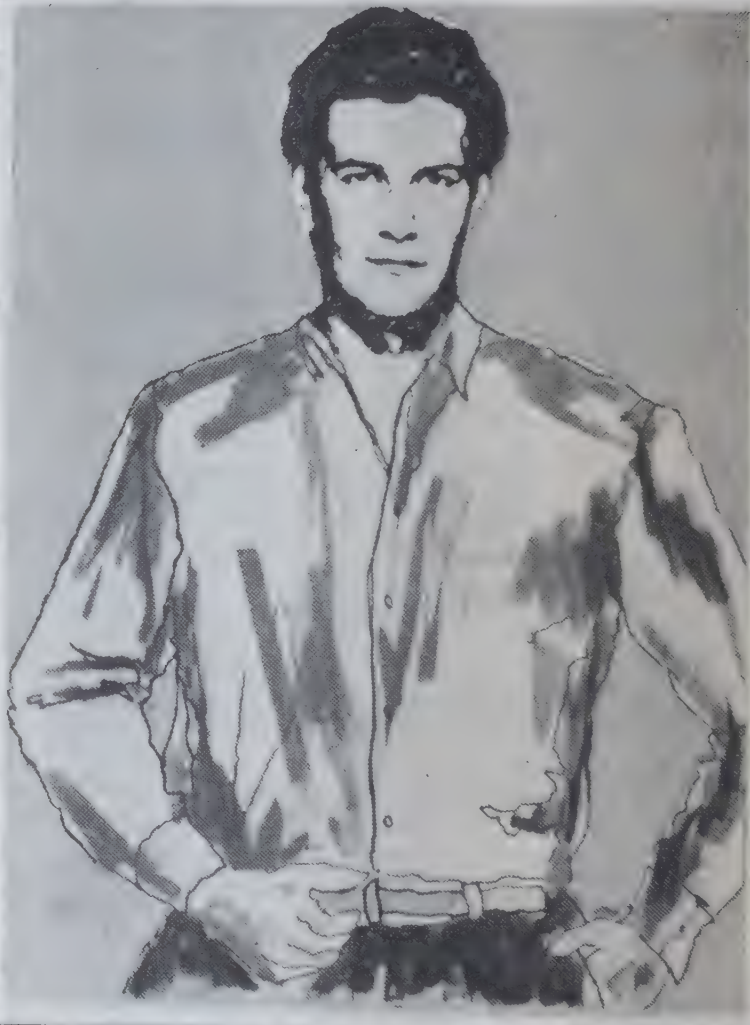
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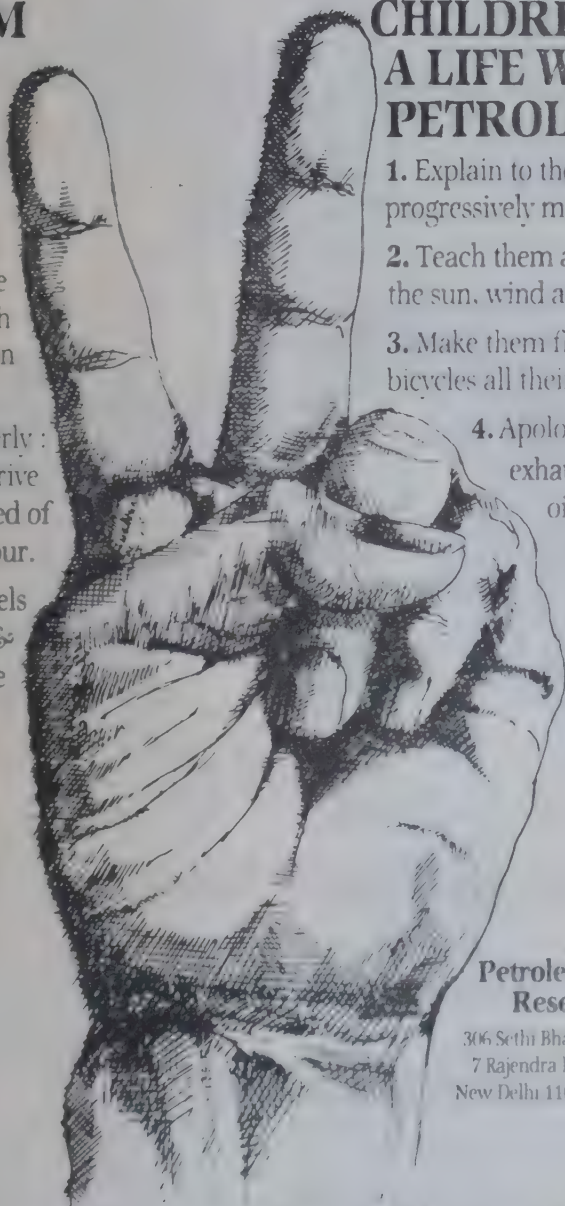
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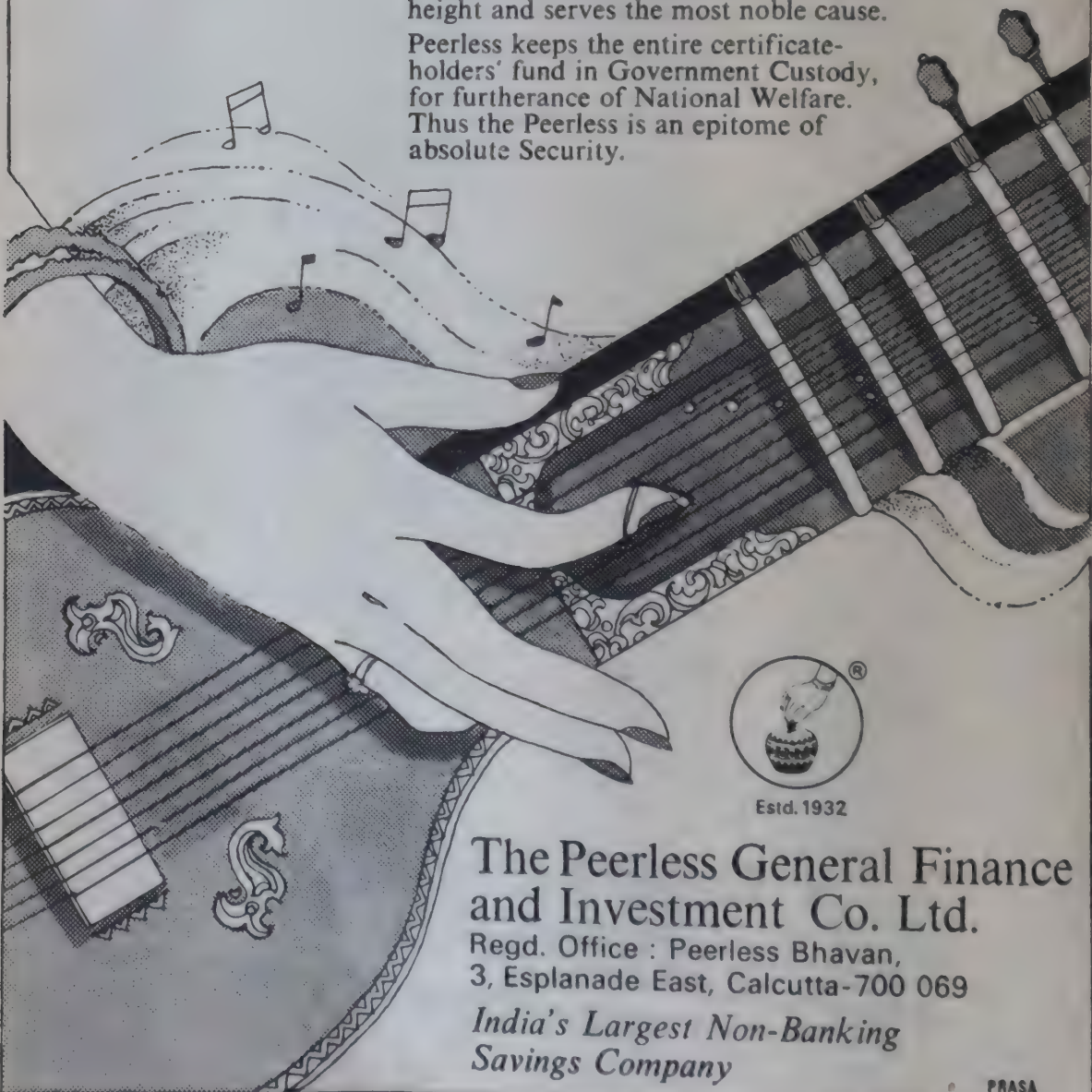


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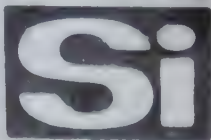
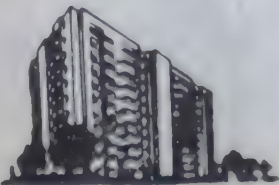


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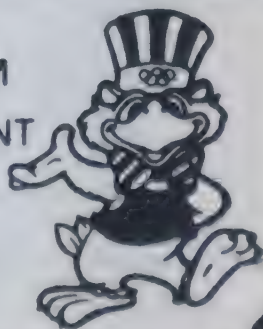


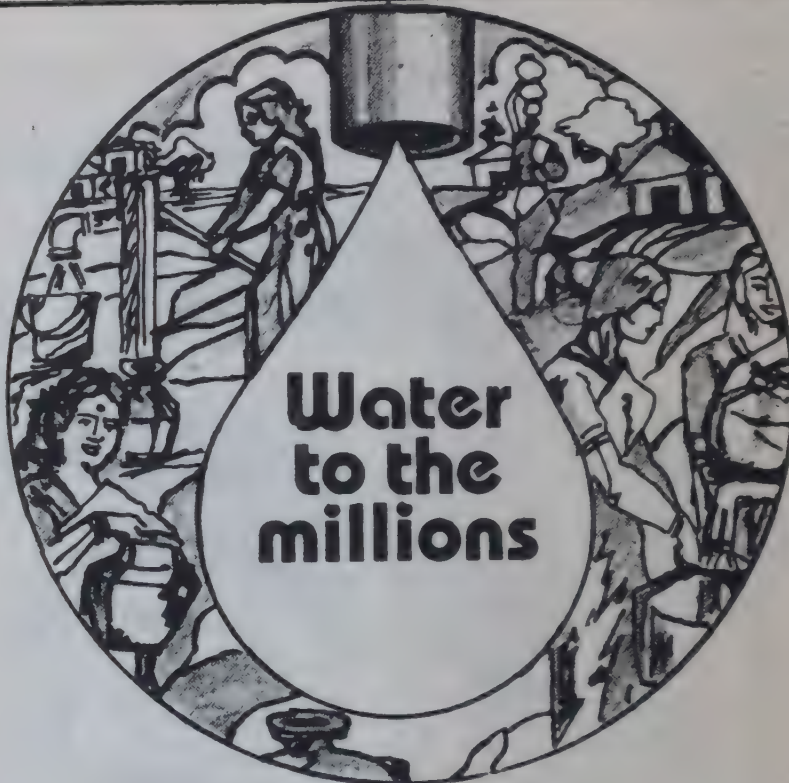
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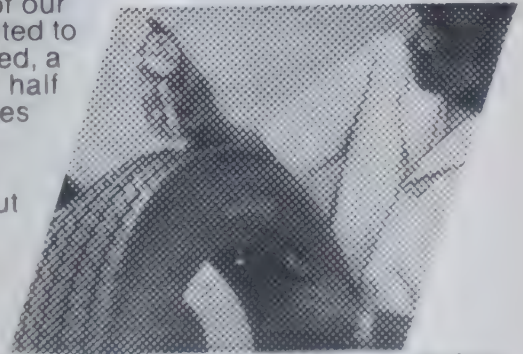
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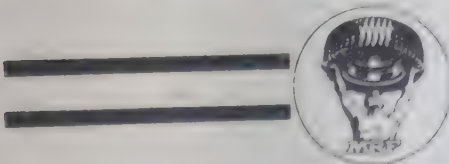
That is why MRF Technicians are right at the Race Track — putting out newer and better tyres to test.

After each race, MRF Tyres acquire new muscle at our factories. With BF Goodrich Technology. The same technology that put tyres on the Columbia Space Shuttle.

At the end of each 'torture-test' on the race-track: Better Construction - More Safety - More Mileage.



The tyres we race are the tyres you buy.

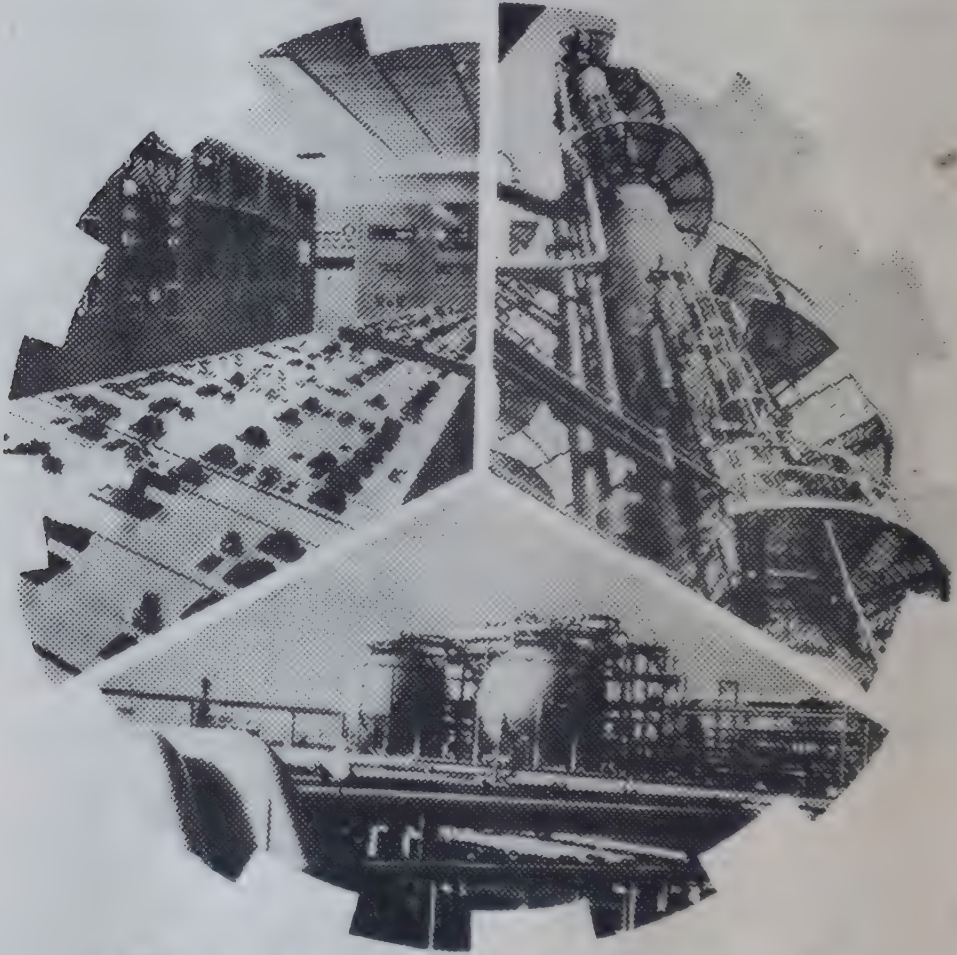


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A case study

Take Mr Kumar as an example. He has an understanding wife, a good job as a senior executive, two teenage children in college. And had only just finished paying for his beautiful home. And disaster struck... a heart attack.

It cost him Rs. 5885 in just 21 days! i.e. Rs. 2985 on ICU and Nursing Home Charges, Rs. 1000 on doctor's consultation fees, Rs. 1000 on daily ECGs and other laboratory tests and Rs. 900 on essential drugs and medicines.

He was lucky to escape with just a garden variety of cardiac arrest. But now the financial pressures are back on him again, to pay back loans he had to take in order to meet his medical bills. Will he be lucky a second time?

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Low cost health insurance for the lowest income group

The UI Hospitalisation and Domiciliary Hospitalisation Benefit Policy has been specially designed for people in the lowest income groups. So that they too can afford today's medical bills. And get back to work faster. This gives the nation's work-force a healthier alternative.

UI Hospitalisation & Domiciliary Hospitalisation Benefit Policy



For more information contact any UI office anywhere in India today!

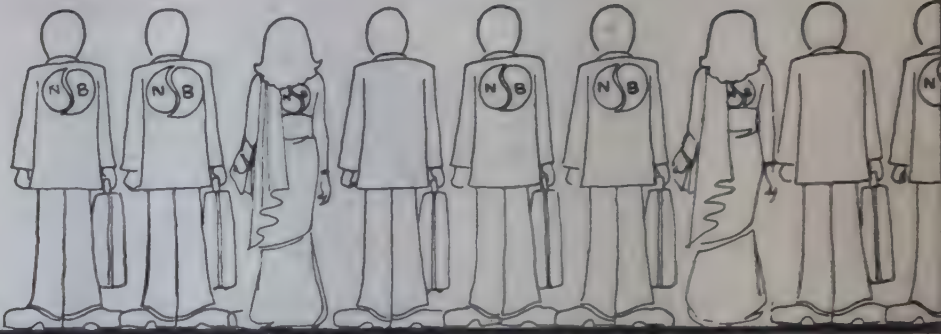


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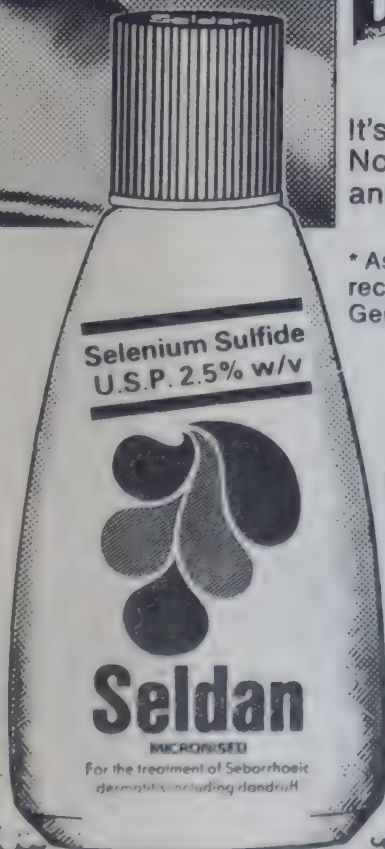
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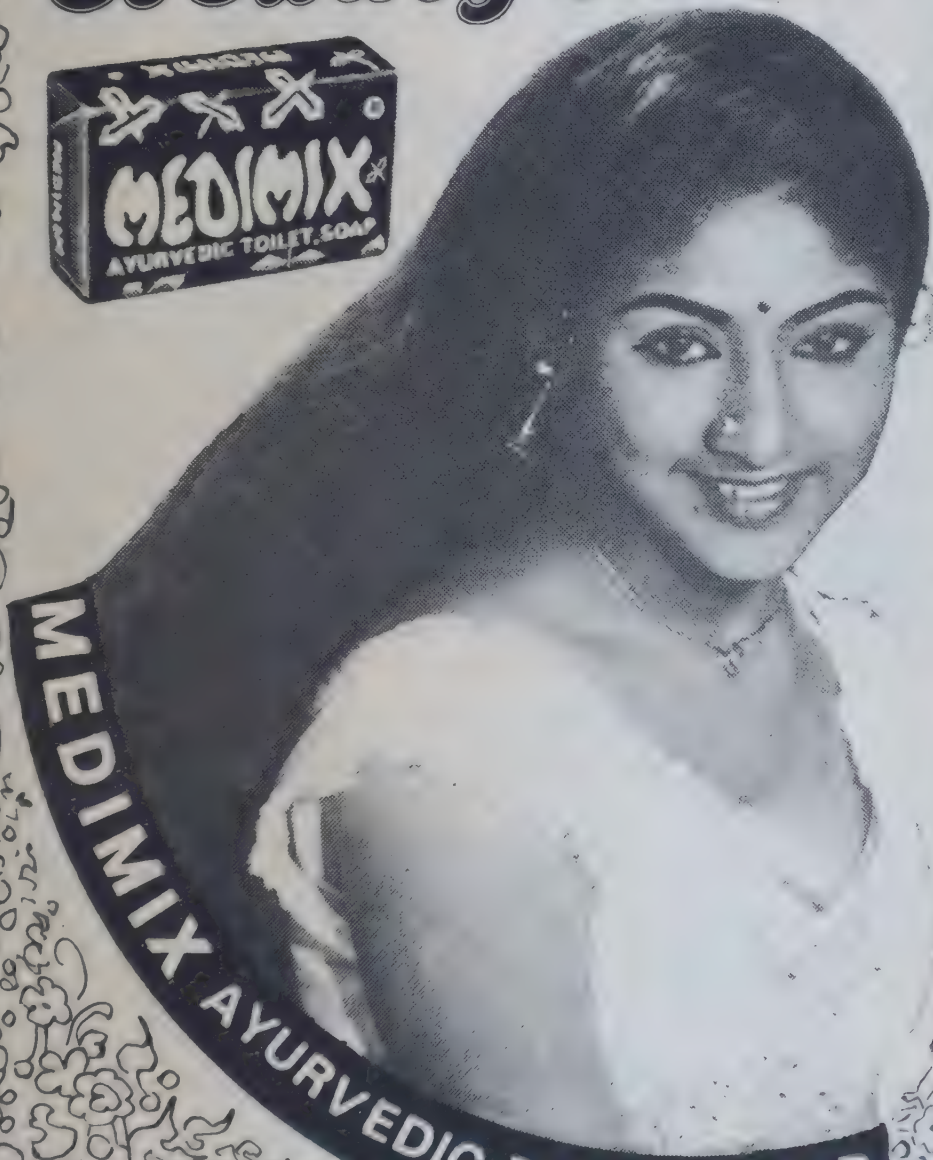
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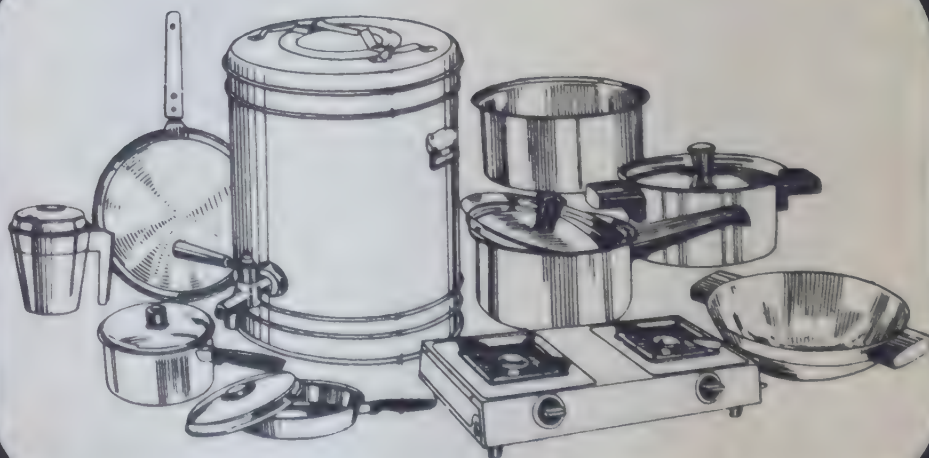
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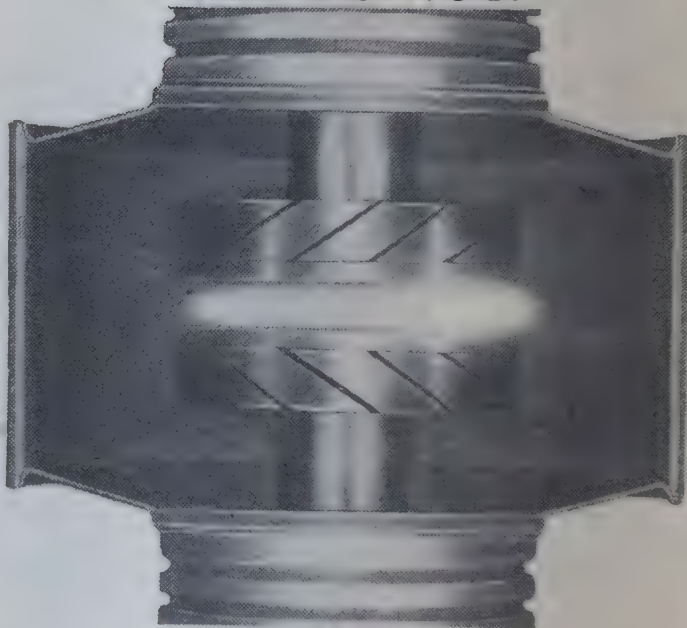
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There was the Oil Circuit Breaker (O.C.B.). Then came the Vacuum Circuit Breaker (V.C.B.) for high voltage power systems, with advantages that made countries such as West Germany, the UK, the USA and Japan turn to this newfound technology. And, very soon, India was following suit.

However, when it came to the heart of the V.C.B.—the Vacuum Interrupter (V.I.)—Indian Industry had no choice but to import it. There was a void, a technological gap that had to be bridged.

THERE WAS A VOID.



NOW, THERE'S A VACUUM.

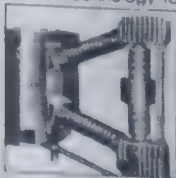
Now, the void will be filled by India's premier professional electronics company. For, BEL has entered into collaboration with Siemens of West Germany, a world leader in switchgear manufacture, to manufacture V.I.s to international standards.

Backing BEL is its vast infrastructure and over two decades of expertise in developing and manufacturing high vacuum devices such as transmitting tubes, microwave tubes, X-Ray tubes, TV picture tubes, image converter tubes, vacuum capacitors and vacuum contactors.

The V.I. made by BEL has several features that mark its superiority:

- Excellent breaking performance—the ability to break very high currents at high voltages in a fraction of a second.
- Low maintenance costs and long life expectancy—the rated continuous current can be interrupted at least 20,000 times.
- High reliability • Safety • Compactness
- Low contact resistance.

By manufacturing V.I.s in India, BEL carries on a long tradition—that of pioneering state-of-the-art technology for Indian Industry. For, BEL has filled the void. Once again.



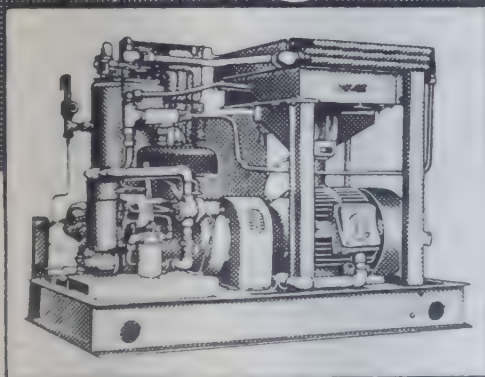
If you'd like to know more about Vacuum Interrupters, write in to the Deputy Manager Sales (electron tubes), Bharat Electronics Limited, Bangalore-560 013.

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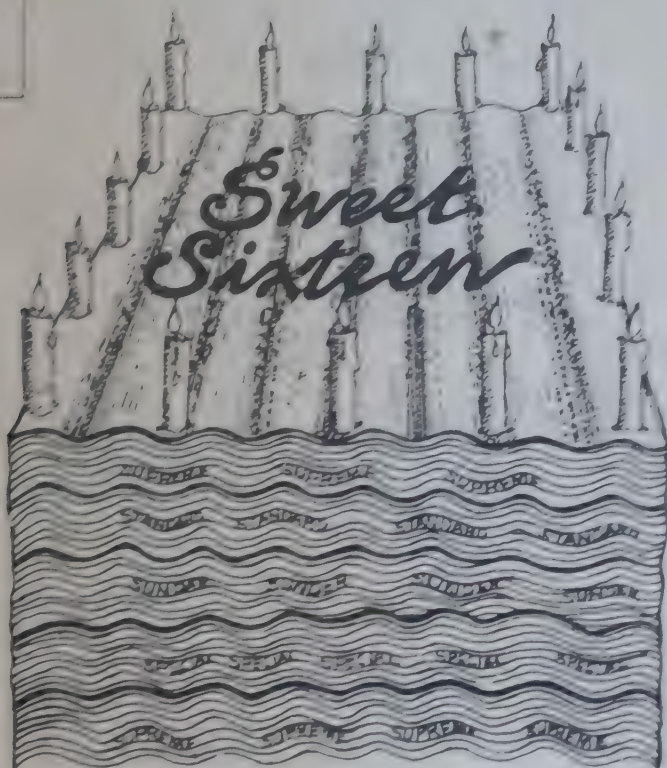
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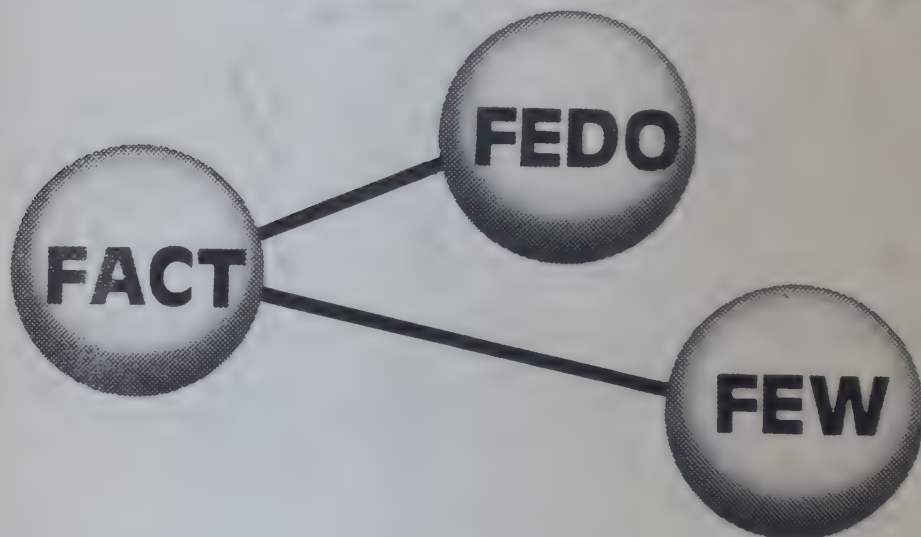
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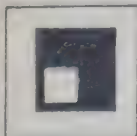
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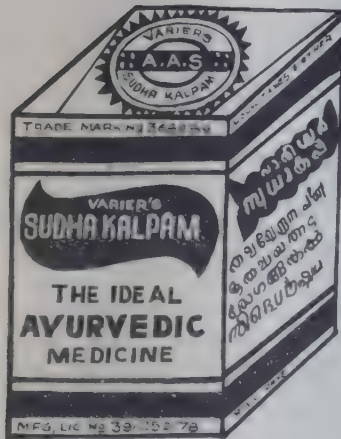
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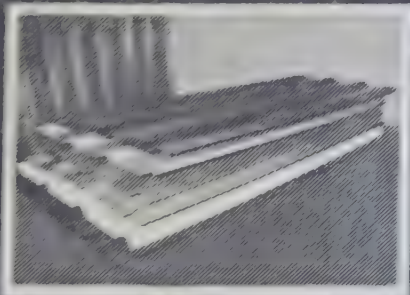
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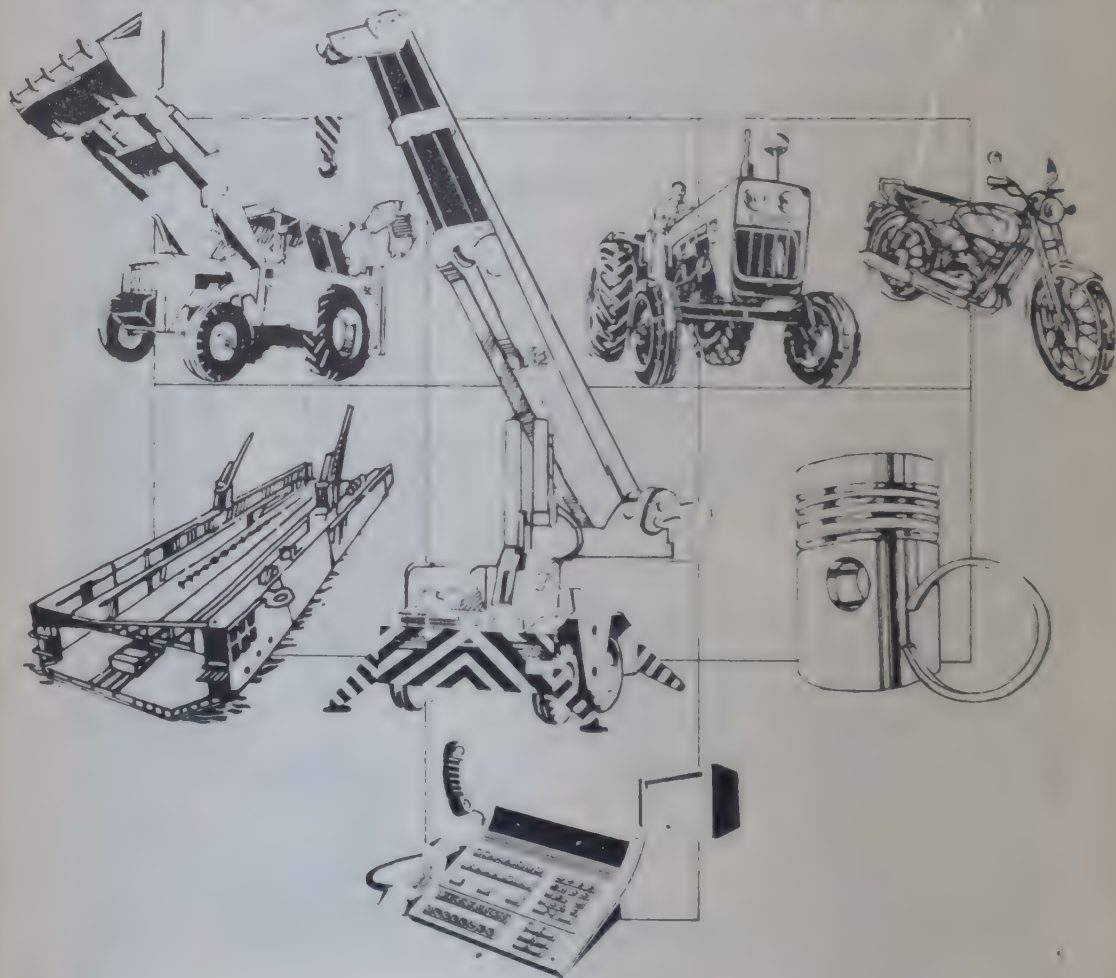
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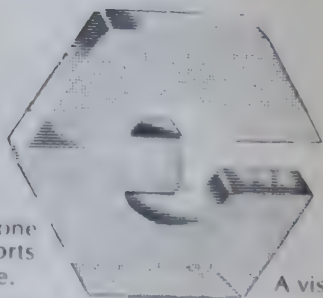
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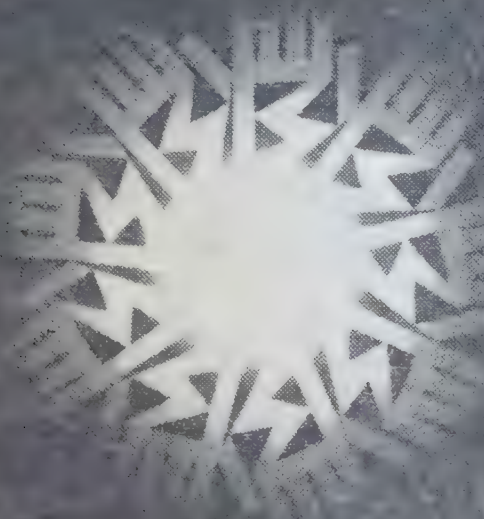
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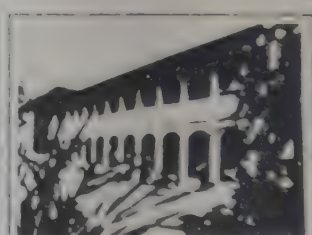
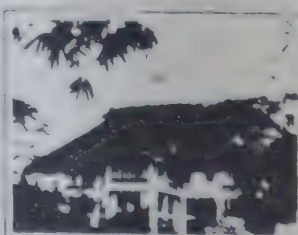
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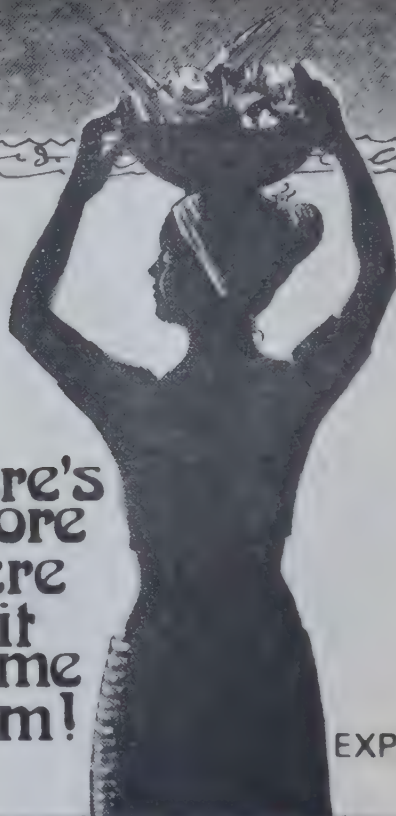
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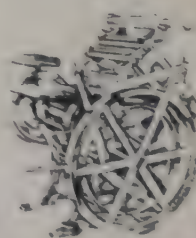
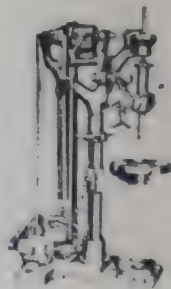
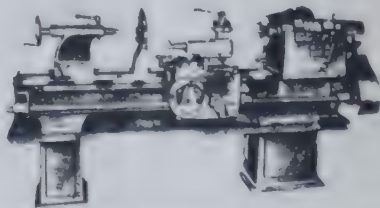
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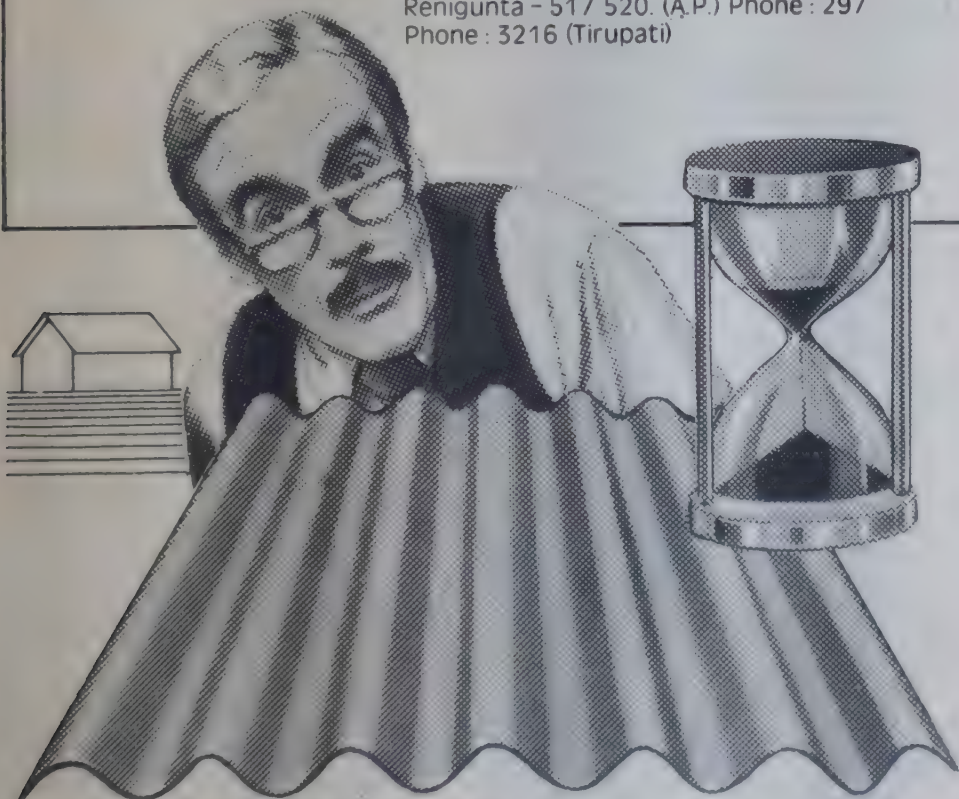
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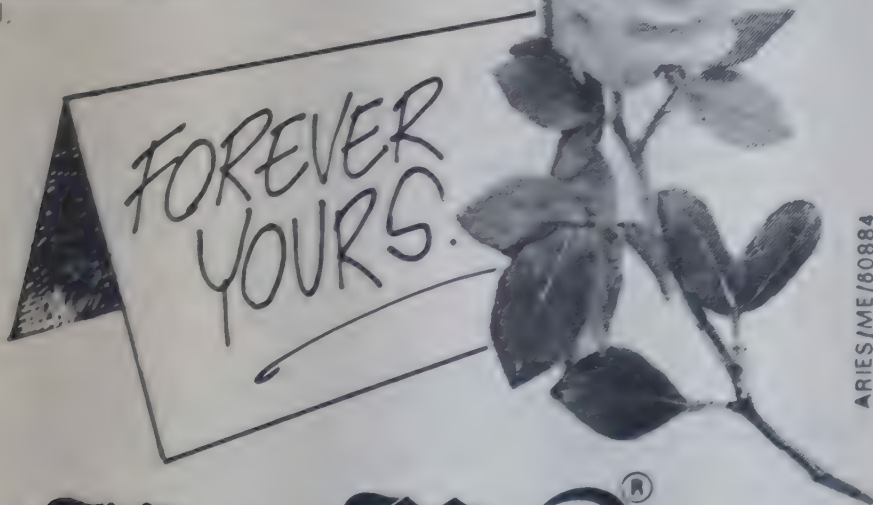
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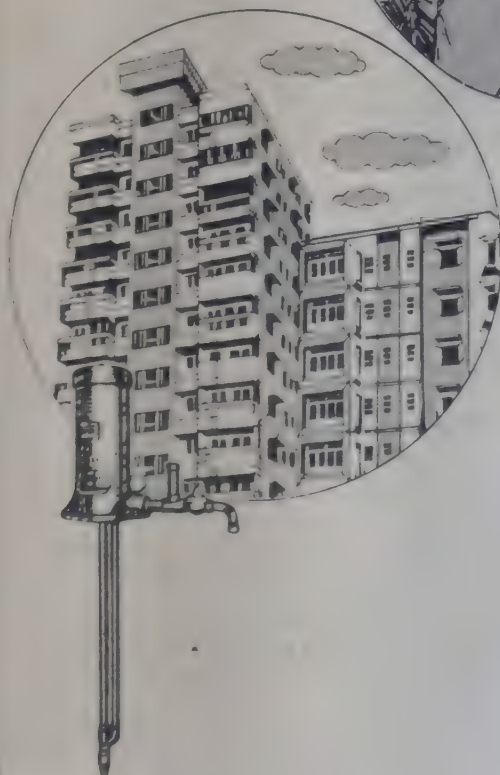
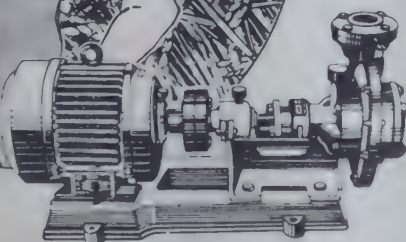
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SCIENCE

Part One

**Science
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1. THE UNIVERSE

The Universe is infinite in time and space. We do not know when it began or when it will end. Of course, the human conception of the universe (or space as is now better known) has been changing with the passage of time.

When the universe was first conceived of as an orderly unit, it was called COSMOS, as opposed to chaos, and the studies relating to the Cosmos were known as Cosmogony or Cosmology. Today, we speak of Space and Space Sciences.

A regular enquiry into the universe was first instituted in AD 140 by Claudius Ptolemy, a Graeco-Egyptian astronomer. He propounded the theory that the Earth was the centre of the universe and that the sun and other heavenly bodies revolved around it. There have been several theories since, the more important of which are given below:

Copernican Theory. In 1543, Polish astronomer Copernicus argued that the Sun was the centre of the universe and not the Earth.† Though the Copernican theory changed the centre of the universe it did not change its extent. The Copernican universe was still equated with the Solar System. It took another three and a half centuries before our ideas changed further. By 1805 telescopic studies made by the British astronomer, Herschel, made it clear that the universe was not confined to the solar system. The solar system itself was only a part of a much vaster star system called the galaxy. The universe thus became quite extensive comprising millions of stars scattered about the Milky Way. But our vision of the universe ended there.

As the 20th century opened, it seemed that the Milky Way galaxy with its cluster of over a hundred billion stars together with its attendant satellites, the Magellanic clouds, actually represented all there was to the universe. In 1925 the American astronomer Edwin P. Hubble (1889-1953) pointed out that there were other galaxies in the universe.

and that the universe actually consisted of millions of galaxies like the Milky Way. In 1929 Hubble proved that these galaxies are flying away from each other and that the farther they are the faster they fly. This meant that the universe is expanding like a balloon that is being blown up. The expansion of space or the flight of galaxies being uniform in all directions, an observer located at any one of the galaxies will see all other galaxies flying away from him at velocities proportional to their distance from the observer.

Looking from the Milky Way, our outer galaxies are receding at increasing velocities. A cluster of galaxies in the constellation of Virgo, some 50 million light years away (from us), is seen moving away at about 750 miles per second, while a group in Hydra, 2700 million light years away, is racing off at as much as 36,000 miles per second. Our own galaxy, the Milky Way, in comparison, appears to move slowly at a modest speed of 600 km per second.

How big? The tricky question still remains unanswered. If, as Hubble showed the speed of galaxies increases with distance there must come a point at which galaxies fly at the speed of light. At this point we cannot observe anything. As Isaac Asimov puts it "From Hubble's demonstration of increasing speed of recession with distance.... it would now appear that at a distance of 12.5 billion light years, galaxies would be receding, relative to us, with the speed of light. Nothing beyond that could be observed. The observable universe has a diameter of 25 billion light years and the number of galaxies it contains is uncertain."*

† Also see *Earth infra*

* Eyes on the Universe.

The movement of a star or a galaxy affects its light as seen by an observer. If the star is moving towards the observer, its light will be shifted towards the blue end of the spectrum. If the star or galaxy is moving away from the observer its light will be shifted to the red end of the spectrum. This is known as the **Doppler Effect or Shift**. The Doppler shifts of galaxies show that they are receding and that the universe is in a state of rapid expansion.

Theories of Space. Modern theories of the universe are based on this flight of galaxies, that is, on the assumption that matter is in a state of rapid expansion.

It seems to be generally assumed that our universe started out as a superdense ball. It is argued that if the universe is now expanding (as Hubble has shown) it must have been, once upon a time, in a state of high compression. High compression means high density. We have, at present, no means of knowing how high the density of the original universe was.

The nearest guess is that the overall density of the universe, at that time, was comparable to the density of the nuclear fluid, tiny droplets of which form the nuclei of various atoms. ★ It is calculated that the density of the atomic nucleus is a hundred thousand billion times greater than the density of water. If the density of the primordial universe was of this order, it follows that each cubic centimetre of space (universe) at the time contained a hundred million tons of matter.

It is a general law that all material bodies are heated when compressed and cooled when expanded. The primordial universe, being highly compressed, must have experienced high temperatures. Heat, as we know, tends to expand matter. High temperatures, therefore, must have, at some point, started an expansion of the universe. It is this expansion which is continuing even now. All theories of space (universe) seek to explain the nature and consequences of this expansion.

Big-Bang Theory. Abbe Georges Lemaitre, a Belgian astronomer-priest, explained this process of expansion, in what is known as the *big-bang theory*. He argued

that billions of years ago, cosmic matter (universe) was in an extremely compressed state, from which expansion started by a primordial explosion. This explosion broke up the superdense ball and cast its fragments far out into space, where they are still travelling at thousands of miles per second. It is from these speeding fragments of matter that our galaxies have been formed. The formation of galaxies and stars has not halted the speed of expansion. And, as it happens in all explosions, the farthest pieces are flying the fastest.

The primordial explosion is the hallmark of the big-bang theory. But it also differs from other theories in two important respects. It disagrees with the Steady State claim, that new matter is being continuously created in the universe. It differs from the Pulsating theory, in that, it does not admit, that matter will revert to the original congestion point, from which the primordial explosion started.

Steady State Theory. This theory originally advanced by two astronomers, Thomas Gold and Hermann Bondi, has since received support from the British astronomer Fred Hoyle. According to this theory, which is also known as the *continuous creation theory*, galaxies recede from one another but their spatial density remains constant. That is to say, as old galaxies move apart new galaxies are being formed in the vacancies. These new galaxies are formed from new matter which is being continuously created to replace old matter which is being dispersed.

An interesting question arises here. How much new matter has to be created to compensate for the dispersion of matter by expansion? George Gamow suggests that if one hydrogen atom per litre of space is created once every billion years, it would be enough to replace matter, which is being lost continuously by expansion. This implies that comparatively very little creative work is involved in replacements.

If dispersing or dissipating galaxies are replaced by new galaxies, the universe will not change in appearance, to an observer located at any one point. Expansion, in other words, does not change the appearance of the universe. It has always been and always will be like what it is now.

★ George Gamow.

Pulsating Universe. According to the Pulsating (Oscillating) Universe theory, advocated by Dr. Alan Sandage, among others, the universe expands and contracts alternately between periods running into tens of billions of years. Dr. Sandage thinks that some 12 billion years ago, a great explosion occurred in the universe and that the universe has been expanding ever since. It is likely to go on expanding for 29 billion years more, when gravitation would halt further expansion. From then on all matter would begin to contract or collapse upon itself in a process known as 'implosion' for 41 billion years into an extremely superdense state which will explode once again. This is the latest theory of the evolution of the universe.

Open or Closed? That the universe is expanding is today considered established. A question that remains unsettled is whether the expansion will continue for ever or whether the receding

galaxies will some day stop and then reverse their motion, eventually falling together in a great collapse. The answer to this question determines the geometrical character of the universe, that is, it determines the nature of space and time. If the expansion continues perpetually the universe is open and infinite; if it will some day stop and reverse direction, the universe is closed and of finite extent.

In order to choose between those possibilities, astronomers construct mathematical models of the universe and then attempt to find observable features of the real universe that would confirm one of the models and exclude all others. So far no single measurement has been made with enough precision to settle the question unambiguously. Several independent tests are possible, however, and pieces of the puzzle have been supplied by many workers employing quite different techniques. It now seems feasible to assemble the pieces. Taken together, the available evidence suggests that the universe is open and that its expansion will never cease.

Origin Of Universe

Astronomers say they've identified the biggest known structure in the universe, an enormous string of galaxies that offers tantalising hints about the origin and possible fate of the universe itself.

The 'filament' of galaxies and clusters of galaxies stretch more than one billion light years, or about 10 trillion billion km, according to the astronomers who reported their finding to the National Science Foundation in Washington.

Dr. Jackburns, Associate Astronomy Professor at the University of New Mexico, said the identification that he and graduate student David Batuski made provides new evidence that there is much more to the universe than the stars and other visible matter.

Without much more than the visible matter, there simply would not be enough mass, enough gravitational force, to hold such a huge supercluster of galaxies together, he theorised.

Growing evidence of the existence of greater amounts of gravitational force also lends support to theories that the "end of the world" may well come when gravity causes the universe to stop expanding and begin to collapse.

"That's probably the biggest unanswered question in astronomy" he said. Whether the universe will keep expanding or whether the entire universe in a number of billions of years will begin contracting down into what some people have called a "big crunch". A.P.: July 23, 1985.

2. OUTER SPACE

The difference between space and outer space is that space means the whole universe including the earth while outer space means all space other than the earths. In facts, outer space begins where the earth's atmosphere ends and extends on and on in all directions.

Outer space is infinite. Our terrestrial units of measurement hardly suit its dimensions. So we have evolved new units of measurement like the *Light Year* and the *Astronomical Unit*.

A Light Year is the distance covered by light in one year in vacuum travelling at speed of 299,792.5 km* per second or about 186,282 miles per second. A light year is thus 5.88 million-million miles.

Astronomical Unit. A new unit in space dimensions has been evolved by radar astronomy. This unit is called Astronomical Unit (A.U.). It represents the mean distance between the sun and the earth, calculated on the data supplied by radars. This distance—the Astronomical Unit—has now become a key constant in determining distances in the solar system.

A.U. in terrestrial measurements is approximately 93 million (92,857,000) miles or 150 million (149,600,000) km. In terms of space dimensions, we may say that a Light Year is made up of about 60,000 A.U.s.

The new technique is likely to revise our established ideas of space dimensions based on the speed of light. It is now known that the velocity of a radar pulse is accurate to one part in 100 million, whereas the velocity of light is known only to be accurate to one part in a million. This means that the error in radar reading is only one hundredth of what it would be in light measurements.

Tracking Outer Space. Light and sound are the two principal media through which we gather our impressions of the external world. Light is something we can see (visible) and sound is something we can

hear (audible). This was considered an axiomatic truth till the end of the 18th century. As the 19th century broke, this simple belief was shattered. Astronomers and physicists learned that there are invisible lights and inaudible sounds.† The first break came in 1800 when the British astronomer William Herschel (1738-1822) discovered infrared radiation.

The Solar Spectrum. When sunlight (white light) is passed through a prism, it is broken up into rays of different colours, like those of the rainbow. Traditionally seven colours are known, which are epitomised by the acronym‡ VIBGYOR, that is, *violet, indigo, blue, green, yellow, orange and red*. This is called the Solar Spectrum, with the violet colour at one end and the red colour at the other end. In studying the heating effects of the solar spectrum, Herschel placed a thermometer in each of the colours of the spectrum and an extra thermometer outside the spectrum at the red end.

The thermometer outside the spectrum (at the red end) showed a higher degree of heat than any other inside the spectrum. He called these rays *infra-red* (below the red) rays. In 1801 the German physicist Johann Ritter (1776-1810) discovered that the rays outside the spectrum at the violet end broke down silver chloride more quickly than the rays within the visible spectrum. These came to be called *ultra-violet* (beyond the violet) rays. It thus turned out that sunlight formed not only a visible spectrum but also an invisible one.

Angstrom Unit. In 1803 Thomas Young (1773-1829), a British physicist,

* This velocity was accepted as one of the Astronomical Constants by the International Astronomic Union in 1968

† See Sound *infra*

‡ See Acronyms *infra*

showed that light travelled in tiny waves of varying wavelengths. The waves were too small to be measured by conventional scales. So Anders Angstrom (1814-1874), a Swedish physicist, evolved a new scale to measure wavelengths. He chose a unit equal to ten billionths of a metre. This has since become known as the *Angstrom unit*. Ten *Angstroms* are equal to a *milli-micrometre* (a thousandth of a millionth of a metre) which in terms of modern SI units* is equal to a *nanometre*.

Measured in Angstrom units, the ultra-violet rays were nearly 4000 Angstroms while the infra-red rays were a little more than 7000 Angstroms. In between came a series of wavelengths for the various colours. They were found to increase steadily from the ultraviolet end, through the violet, indigo, blue, green, yellow, orange and red to infrared at the other end.

Wider Spectrum: The invisible ultra-violet and infra red radiations remained inexplicable till James Clerk Maxwell (1831-1879), the British physicist, came out with his *Electro-magnetic thesis* in 1870. Maxwell argued that electricity and magnetism were different aspects of a single electro-magnetic field. Periodical variations in the electro-magnetic field produced electro-magnetic radiations of varying lengths. The visible light is only one part and a very small part of the electro-magnetic spectrum. He also postulated that there can be other invisible radiations much shorter than the ultra violet at one end and far longer than the infrared at the other.

The Maxwellian theory was vindicated when the German physicist Heinrich Hertz (1857-1895) produced electro-magnetic radiations with wavelengths much longer than the infra red. These wavelengths were at first called *Hertzian waves* but eventually came to be known as *radio waves*. Then in 1895, another German physicist Wilhelm Rontgen (1845-1923) discovered what he called X-ray radiation. The X-ray was later found to be much shorter in wavelength than the ultra violet.

In 1896, the French physicist Henri Becquerel (1852-1905) discovered the phenomenon of *radio activity*, Becquerel did not at that time know why or in what manner this

radio activity took place. Subsequently it was found that this radio activity was caused by the atoms of the heavy metal *uranium* giving off a constant emission of radiation and particles. It was further shown that this radio activity was also electro-magnetic in nature. Rutherford named it the *gamma ray*. The gamma ray had a wavelength even shorter than that of the X-ray.

Photons. In 1905 Einstein showed that all forms of radiation travelled in wave packets, which acted like particles in some ways. He called these packets *Photons*. The energy of the photons increased as the wavelength decreased. The wavelength is related to frequency, that is to say, the number of vibrations or waves or cycles per second. The shorter the wavelength the higher the frequency and the greater the energy. Thus gamma rays with the shortest wavelength below 0.01 nano-metre) are the most energetic, the energy decreasing as the wave length increased, through X-ray (1 to 0.01 nano), ultra-violet (1 to 400 nanos) visible light in all the colours of the spectrum (400 nanos to 700 nanos) infra red (700 nanos to 1 meillimetre), micro waves (1 millimetre to 500 millimetres or 50 centimetres) to radio waves which have the longest wavelengths (50 centimetres to 3000 centimetres or 30 metres) and the lowest energy content (see Tables below)

Thermal Radiation. Every object which is at a temperature above *Absolute Zero†* (-273°C) radiates photons of all kinds. The average energy of the photons emitted increased with the temperature. We experience this heat during the peak period (noon) in visible light radiation. But even object which are not hot enough to glow like the sun still radiate quantities of infra-red radiation. Our own bodies, for instance. Even objects below our body temperature i.e. cool bodies, radiate micro waves and longer radio waves. These radiations called *thermal radiations* can indicate the temperature levels of the objects emitting them.

Radio Waves. These are the radiations with the longest wavelengths that is from 50 centimetres to as much as 30 metres. Objects in outer space that emit such radia-

* See International System of Units infra.

† All objects that we know of have temperatures above Absolute Zero. See Cryogenics infra.

tions are called *radio sources*.

Windows on Space. The atmosphere of the earth is like a sieve which allows only some wavelengths from outer space to reach us. Sunlight forms one group of wavelengths which come down through the atmosphere. This includes not only the visible light but also a part of the invisible light, namely the near ultraviolet (400 to 300 nanos) and the near infrared (700 to 2500 nanos). This is one of the windows that open out on

outer space.

The other window is called the *microwave window*. This window covers all wavelengths from one millimetre to 30 metres (see *Atmosphere* infra). The existence of the microwave window was not particularly noticed or studied till 1932 when Karl Jansky of the Bell Telephones announced that he had received radio messages from outer space. (see *Radio Telescopes* infra)

3. MODERN ASTRONOMY

Modern astronomy began with the Italian astronomer Galileo. In 1609 Galileo heard of the telescope made by the Dutchman Hans Lippershey. He improved upon it and constructed a similar instrument that could magnify upto thirty diameters.

It was this instrument, known as *refractor telescope*, that opened the field of optical astronomy. Galileo made several startling discoveries. He found the Moon's surface to be rugged, and the Pleiades to contain over 40 stars. He discovered four of Jupiter's moons and observed the sunspots.

Refractor Telescopes. Following are the important observatories equipped with Refractor Telescopes. Lense diameter in inches, in brackets.

Yerkes Observatory, Williams Bay, Wisconsin.(40) Lick Observatory, Mount Hamilton, California. (36) Observatoire de Paris, Meudon, France.(32.7) Astrophysikalisches Observatorium, Potsdam, Germany (32) Allegheny Observatory, Pittsburgh, Pennsylvania.(30) Royal Greenwich Observatory, Herstmonceux, England.(28) Universitata-Sternwarte, Vienna, Austria. (26.5) Union Observatory, Johannesburg, South Africa. (26.5) US Naval Observatory, Washington D.C. (26) Leander-McCormick Observatory, Charlottesville, Virginia (26) Royal Greenwich Observatory, Herstmonceux, England. (26) Sternwarte-Berlin-Babelsberg-Berlin, Germany.(28) Astronomical Observatory Belgrade, Yugoslavia (26) Tokyo Astronomical Observatory, Mitaka, Tokyo, Japan. (26) Mount Stromio

Observatory, Canberra, Australia. (26) Astronomical Observatory of the USSR Academy of Sciences, Pulkova. (26)

In 1668 Newton invented a new instrument, the *reflector telescope*. In a refractor telescope, light is gathered by a large objective lens. In a reflector telescope a large curved mirror is used for this purpose. Both these types of optical telescopes are still in use.

Reflector Telescopes. Following are the important observatories equipped with Reflector Telescopes. Mirror diameter in inches in brackets.

Academy of Sciences of the USSR, Zelenchukskaya, USSR. (236), Palomar Observatory, Mount Palomar, California. (200), Kitt Peak National Observatory, Tucson, Arizona. (150), Inter-American Observatory, Cerro Tololo, Chile. (150), Mount Stromio Observatory, Canberra, Australia. (150), European Southern Observatory, La Serena, Chile. (140), Lick Observatory, Mount Hamilton, California. (129), European Southern Observatory, La Serena, Chile. 120), McDonald Observatory, Fort Davis, Texas. (107), Crimean Astrophysical Observatory, Nauchny, Crimea, USSR.(104), Mount Wilson Observatory, Pasadena, California. (100), Royal Greenwich Observatory, Sussex, England. (98), Steward Observatory,

University of Arizona, Tucson, Arizona. (90), Institute for Astronomy, University of Hawaii, Mauna Kes, Hawaii. (88), Kitt Peak National Observatory, Tucson, Arizona. (84), McDonald Observatory, Fort Davis, Texas.(82)

The invention of the optical telescope was an epochal event in the history of astronomy. The instrument so caught the fancy of the astronomer and the layman alike, that all advanced countries vied with one another in building bigger and bigger telescopes.

Radio Astronomy came into being in the most unexpected manner. In 1931, Karl Jansky, an American radio engineer working in Bell Telephone Laboratory noticed a steady stream of radiation coming in from outer space. It is strange that professional astronomers of the time paid little attention to this discovery. However, it attracted the attention of an amateur radio operator in U.S. Grote Reber, who set out by himself to learn more about this extraterrestrial phenomenon. He worked single handed for nearly ten years, studying the sky and analysing radiations. In 1937, he built the world's first *radio telescope* – a 31-feet 5-inches parabolic dish– and set it up in his backyard at Wheaton, Illinois. In 1940 he produced a radio map of the sky, the first of its kind in the world. Thus a new branch of astronomy was opened–Radio Astronomy.

The radio telescope is in many ways analogous to the optical telescope. It consists of a large metal reflector fitted with an antenna. The metal reflector collects and focuses radio energy on the antenna which can be tuned to any desired frequency. A sensitive radio receiver picks up the radiation from the antenna and records it. This is analysed in a computer and studied.

All types of radiated energy are electromagnetic in nature. They differ from one another in wavelength and frequency. Much of the radiation like X-rays, gamma rays, ultra violet rays and the like are absorbed by the atmosphere and reflected back into space. All the same, a persistent stream of radiation reaches the earth. This includes a steady, weak but quite perceptible background radiation called *continuum radiation* which is being received from all parts of the universe. Recent research has shown that this background radiation may perhaps hold the key to the formation and destruction of stars and galaxies.

Other Astronomies. In the sixties satellite technology took astronomical investigations farther afield. Until then astronomical studies were entirely ground-based. Now satellites made it possible to study astral phenomena from above the atmosphere. Thus astronomy came to be studied from two levels– from the ground and

Large Radio Telescopes

Location	Description	Appro. Effective Area in Sq.m	In operation since
Jodrell Bank Manchester, UK	Dia. 76 m Parabolic dish	3×10^3	1957
Green Bank, West Virginia USA	Dia 92 m Parabolic dish	4.5×10^3	1962
Parkes, Australia	Dia. 64 m Parabolic dish	2.3×10^3	1962
Arecibo, Puerto Rico	Dia. 300 m Spherical dish	3×10^4	1964
Green Bank, West Virginia USA	Dia. 42 m Parabolic dish	1×10^3	1965
Lake Traverse, Ontario, Canada	Dia. 46 m Parabolic dish	1.1×10^3	1966
Udagamandalam, India	530 m NS×30 m EW Parabolic Cylinder	8×10^3	1970
Effelsburg, West Germany	Dia. 100 m Parabolic dish	5.5×10^3	1972
Zelenchukskaya, North Caucasus, USSR	Ratan 600, 896 panels mounted on a circle of dia 576 m.	1.4×10^3	1974

from above the atmosphere. This led to the emergence of many specialised fields in astronomy – X-ray, Ultraviolet, Gamma ray and Infra red.

X-ray Astronomy. It has long been known that the sun emits X-rays. But the first X-ray source beyond the sun, that is, outside the solar system was discovered as late as 1962 (in a rocket experimnt) in the constellation of Scorpius. Named Sco X-1, it is the brightest X-ray star in the sky. It is truly an X-ray star since it emits 99.9 per cent of its radiation in X-rays.

Organised research in this field was initiated only in 1970 with the launching of the X-ray satellite UHURU (a Swahili word for freedom). This satellite was launched from San Marcos island off the coast of Kenya. Uhuru has discovered quite a number of X-ray sources, as many as 400 by 1976.

But perhaps, the most significant contribution of X-ray astronomy is in the study of inter-galactic gases, which have so far eluded close scrutiny. There is evidence that the entire space between galaxies is filled with very hot gases with temperatures going up to tens of millions of degrees. The cosmological significance of this is that the amount of matter in the universe will determine the future evolution of the universe.

Ultra Violet Astronomy ¹⁵ is confined to wave lengths between 912Å and about 3000 Å (S.2). The first successful observation in the UV region of the spectrum was made in 1946, when the Naval Research Laboratory, USA, flew a captured German V-2 rocket. The first successful detection of far ultraviolet radiation outside the solar system was also made by the Naval Research Laboratory in 1955 with the help of an *Aerobee 25* rocket. Ultraviolet astronomy is especially useful in many cases where other techniques have failed to bring in any worthwhile information. Thus there are many young massive stars with effective surface temperatures of 10,000 K which emit mostly in the ultraviolet region. These stars can be properly studied by ultraviolet astronomy only.

Gamma Ray Astronomy. Gamma rays have the shortest wavelengths and are the most energetic rays so far known.

Because of their great penetrating power, they are not absorbed by the inter-stellar matter and therefore reach us almost unchanged from all parts of the universe.

Gamma ray astronomy was born in 1968 with the discovery of very hard gamma ray radiation from the central region of our galaxy by a team of scientists at the MIT,† USA, who had flown a sophisticated gamma ray detection on board the Orbiting Solar Observatory-3 satellite. Subsequent observations on celestial hard gamma rays from experiments on the US Small Astronomy Satellite-2 and European COS-B satellite have established gamma ray astronomy as an observational science.

Gamma rays react with cosmic rays, inter-stellar matter, magnetic fields and low energy photons. These are wide ranging reactions. A better understanding of these reactions will provide a clearer view of the cosmos.

During the last few years some 27 new hard gamma ray sources have been discovered. Of these 2 are extra galactic, that is, outside our galaxy.

Infra Red Astronomy. Infra red astronomy is important because it enables us to observe objects at temperatures between about 10K and 2000 K, whether they are cool stars or dust cloud (S.2). In the solar spectrum the region nearest to the visible red is called the near infra red. (S.2) A portion of this near infra red can be detected with special photographic plates. Hence this part of the infrared is called the *photographic infrared*. Higher wavelengths can be detected by other methods.

The IR (infra red) telescope is quite similar to the optical telescope. In fact, optical telescopes are commonly used as IR telescopes by the addition of appropriate detectors. The sun, moon and the planets emit abundantly in the infrared region and provide us a lot of information through IR telescopes.

Star-forming clouds where 'proto stars' are taking shpe are particularly rich in infrared radiation because the surface temperature is very low making them quite visible in the infrared.*

† Massachusetts Institute of Technology

* See Box Orion Molecular Complex.

Radar Astronomy. Radar astronomy was born in 1940, when a Hungarian physicist Zoltan Bay sent out a beam of micro waves to the moon and detected the return echo. The basic principle is simple. Short pulses of high frequency radio energy are aimed at a target from which the pulses are reflected to the earth, where they are picked up by a sensitive antenna receiver system. We know beforehand the speed at which radar pluses travel, so that the time between their transmission and reception can be converted into a measure of distance.

Radar astronomy is really a part of radio astronomy since micro waves can rightly be considered a part of the electromagnetic spectrum.

Radar techniques in recent years have substantially added to the stock of our knowledge of astronomy. The surface of Venus, for example, is covered by a thick layer of clouds against which our optical telescopes were quite helpless. But microwaves have pierced through the clouds and have sounded the solid surface of Venus. The first readings showed a high mountain range. Subsequent readings have helped us to make a radar map of the surface. Various bits of information about other planets have been and are still being collected by radar readings.

Super Telescopes: A new generation of "super telescopes" being designed for mountaintops around the world could usher in a goldenage of astronomy by

the early Nineties. At least seven mammoth optical telescopes—four on drawing boards in the United States—are now being planned, each of which will have more than twice the light-gathering capacity of today's biggest devices.

Behind the spurt in jumbo telescopes are several radical new ideas on how to build them. Ever since the dedication of the 200-inch Hale telescope —still the world's premier optical device—atop California's Mt. Palomar in 1948, astronomers have thought they had reached the technical and financial limits of big-telescope construction.

The reason: the mirrors. They effectively determine the power of a telescope. The bigger the reflector is, the more light it can collect from objects in space. Yet a mirror much larger than Hale's wouldn't hold its shape because of its weight.

Astronomers have been able to offset this problem somewhat with advances in light - detection systems. Electronic detectors now record more than 60 times the number of photons (massless sub atomic particles that transmit light) collected by mirrors than those of 20 years ago. But advances in these systems are fast approaching their limits. Thus the need for bigger telescopes altogether.

One emerging idea is to use many pieces of glass fitted together like a mosaic instead of casting a single continuous concave surface. A version of the approach devised by astrophysicist Jerry Nelson and

Radar Astronomy Systems

Antenna Diameter (feet)	Observatory	Peak Transmitted Power (kilowatts)
1000	Arecibo Ionospheric Observatory, Arecibo, Puerto Rico	2500
250	Jodrell Bank, Maclesfield, England	60
120	Haystack Lincoln Laboratory, Massachusetts Institute of Technology, Tyngsboro, Massachusetts.	400
85	Jet Propulsion Laboratory, Goldstone Lake, California.	100
84	Millstone Lincoln Laboratory, Westford Massachusetts Institute of Technology, Westford, Massachusetts.	5000
50 (8)	Crimean Deep Space Tracking Station, Crimea, USSR.	60

colleagues at the University of California, is to be used in the new Keck Observatory.

World's Largest. This 390-inch telescope is likely to be the first of the new extra-large instruments to come on line. If completed by 1992, as envisioned, the Keck telescope would be the world's largest—nearly twice as big as Palomar and capable of detecting a candle on the moon. Developed by the University of California and the California Institute of Technology (Caltech), it will sit atop Koa-studded Mauna Kea, an extinct volcano in Hawaii.

The main mirror of the telescope will contain 36 hexagonal pieces, each 6 feet wide and 3 inches thick. A computerised positioning system will keep them moving in concert with up to 100 adjustments possible each second, down to 1/1000 the width of a human hair. Although not yet tested on a

large scale, the "segmented mirror" scheme should yield other benefits as well. Because the mirrors can sit on lighter supports, the 10-metre telescope will probably weigh less than one-third of the Hale telescope. A shorter focal length – and thus a stubbier barrel – will mean that a smaller dome can house it (Domes can account for one-half the cost of an observatory).

The instrument should have enough power to peer back in time "12 billion years, nearly three quarters of the period back to the birth of the universe."

A different optics arrangement altogether is being envisioned for an even-bigger device, the National New Technology Telescope (NNTT) which would be federally funded and perhaps perched on the same volcano crest. It calls for a mirror arrangement similar to that used successfully

INDIA'S GIANT STRIDE

There has been an explosion in astronomical research in recent times and India is in the forefront of the giant stride.

Of the three leading observatories in India, the oldest one (founded in Madras in 1972 and managed and run by the Indian Institute of Astrophysics in Bangalore) acquired the largest telescope in Asia in 1985. Erected at Kavalur, in Tamilnadu, at a cost of Rs.5 crores, it has a 93-inch telescope weighing 125 tonnes. Right from designing to erection, everything is indigenous.

Apart from this, three ground-based telescopes will be available in India in the coming years—an infra-red telescope being built by the Physical Research Laboratory, Ahmedabad, a millimetre wave radio telescope being built by Raman Research Institute, Bangalore and the Giant Metrewave Radio Telescope to be built by Tata Institute of Fundamental Research.

The Giant Metre Wavelength Radio Telescope (GMRT) will be the largest telescope of its kind in the world and will remain in the forefront of metre wavelength radio astronomy for a long time. With an estimated cost of Rs 20 crores, it will have 34 parabolic cylindrical antennae, each 92 metres long and 35 metres wide, providing total collecting area of about 1,09,000 sq.metres.

The effective collecting area of GMRT will be about twice that of Arecibo Radio Telescope in Puerto Rico and eight times that of the very large array in New Mexico, USA.

Tata Institute of Fundamental Research already runs the Radio Astronomy Centre at Udagamandalam in the Nilgiris District in Tamilnadu. It has a radio telescope with an effective collecting area of about 8000 sq metres. Designed and constructed indigenously in 1970, this telescope is capable of detecting very weak radio sources in the sky.

These facilities have been utilised by the scientists to study the variation of the angular sizes of radio sources with their intensities and to interpret them as evidence in support of the Big Bang hypothesis of cosmology as against the rival steady state hypothesis. The data obtained have also contributed significantly to the understanding of the physics of radio sources

in the much smaller multiple-mirror telescope outside of Tucson, Arizona. The idea is to mount mirrors like guns on a ship. With the NNTT four 295-inch reflectors would sit on a common mount. They could be used individually or their images combined optically to serve as one jumbo eye.

Space Telescope. These are not the only telescopic titans on astronomers drawing boards. The University of Texas has been scouting funds for a similar size telescope, which would use either an Angel honeycomb mirror or a design of its own that resembles a huge contact lens. Japanese

astronomers are looking at Mauna Kea as a possible site of a 295-inch instrument. West European countries are considering plans for an array of four separate telescopes in Chile. The Soviet Union, meanwhile, continues to harbour ideas for a 25-metre behemoth using more conventional design techniques.

Astronomers argue, perhas predicatably that all these telescopes are needed despite plans for a new space telescope and other instruments soon. They note that different telescopes perform different tasks and they point to the sheer number of cosmic riddles demanding attention. - **Christian Science Monitor**

4. THE WORLD OF SOUND

Radio Telescopes have opened a new world to the astronomer – a world of sound, not of sight. The two worlds are fantastically different. The Milky Way, for example, is a river of light to the eyes but it is a hissing mass to the ears.

Radio Telescopes, in fact, help us to listen in to stars or galaxies that lie far beyond the ken of the world's largest optical telescopes. They also enable us to study astral phenomena which are within the range of our optical telescopes but which are not visible owing to the haze of cosmic dust. Thus it is that we have managed to collect what little we know about the galactic centre of the Milky Way (See the *Milky Way*).

Sound is produced by the vibrations of an object or mechanism and transmitted in the form of waves – alternating increase and decrease in pressures. It radiates outward through a material medium of molecules, more or less like the ripples spreading out on water after some heavy object has been thrown into it.

Two elements of sound are important, namely the *pitch* or *frequency* and *intensity* or *loudness*. The pitch or frequency refers to the rate of vibration of the sound and is measured in Hertz (Hz) units. The frequency of sound is determined by the number of times the vibrating waves undulate per second. The slower the cycle the lower the pitch. The pitch becomes higher as the cycles increase in number or which is the same thing, as frequencies increase.

The intensity or loudness is measured in

decibels. A decibel (db) (one-tenth of a *bel*) is a physical unit based on the weakest sound that can be detected by the human ear. It is named after A. G. Bell, the inventor of the telephone. The decibel scale is logarithmic, that is, an increase of 10 db means 10 times as much, an increase of 20 db means 100 times and 30 db 1000 times etc. A light whisper may be about 10 db, a quiet conversation around 20 db, and normal talk 30 db. In comparison the electrically amplified beat music in a disco is a billion times louder than the sound of a whisper at 10 db. (see Box *Noise Scale*).

Ultra-sonics. The human ear cannot generally hear sounds of frequencies higher than 20,000 vibrations per second or in modern International Units 20,000 Hz. (see *International Units* infra). Sounds of frequencies higher than 20,000 Hz which are inaudible are called *ultra-sonic*. Bats produce very high sound when they fly but they are at ultra-sonic frequencies from 20,000 to 100,000 Hz. So we cannot hear them. Ultra-sonic waves are an important tool of research in physics. There are also many applied uses for ultra-sonic waves, like submarine echo sounding, detection of flaws in casting, drilling glasses and ceramics, emulsification etc.

Noise Scale

1. Breathing	10 db	14. Heavy truck traffic	90-100 db
2. Wind in the trees	20 db	15. Motor Cycle	105 db
3. Quiet Conversation	20-30 db	16. Pneumatic drill	110 db
4. Ticking Clock	30 db	17. Thunder storm	110 db
5. House in a quiet street	35 db	18. Beat Music	
6. Radio Music	50-60 db	(electrically amplified)	120 lb
7. Loud conversation	60 db	19. Aircraft noise	90-120 db
8. Office noise	60 db	20. Jet takeoff	
9. Children playing	60-80 db	(at 100 m distance)	120 db
10. Lawn mower	60-80 db	21. Jet engine	
11. Vacuum cleaner	80 db	(at 25 m distance)	140 db
12. Traffic Noise	60-90 db	22. Space Vehicle launch	
13. Sports car	80-95 db	(from a short distance)	140-170 db

The speed of sound varies according to the nature of the carrier media. When we speak of the speed of sound, we ordinarily mean the speed at which sound travels in air at sea level. This is around 1088 feet per second. In water, sound travels about 5 times faster than in air. In iron and steel it is even faster, about 3 times faster than the speed in water. Speeds of sound through some selected media are indicated below: *ice-cold water*-4938 ft. per second, *brick*-11,620 ft., *granite*- 1296 ft., *hardwood*-12,620 ft. and *glass*-16,410 to 19,690 feet per second.

Super-Sonics. Supersonic speed is speed greater than the speed of sound (in air at sea level), that is to say, around 760 miles per hour. Spersonic speed is measured in *Mach*. This unit was worked out by the Czechborn German physicist *Ernst Mach* and therefore named after him. Mach is the ratio of the speed of flight to the speed of sound, under the same conditions of pressure and density. When a plane moves at the speed of sound, it is Mach 1. When a plane moves at twice the speed of sound (supersonic), it is Mach 2. When it is less than the speed of sound it is *sub-sonic* and therefore lesser than Mach 1. At half the speed of sound it is Mach ½.

Sound barrier. Sound barrier is the point at which the speed of flight equals the speed of sound. When a plane flies faster than sound, it is said to cross the *sound barrier*. When the sound barrier is passed, the speed of the aircraft produces shock

waves in the atmosphere, somewhat like the bow waves produced by fast-moving ships. The shock waves in the atmosphere produce booms like thunder claps. These are called *sonic booms*. The sonic booms jar on the ears of the resident population in the areas over which the plane flies but they do not trouble the passengers or the crew because the plane goes faster than the shock waves which are, in a manner of speaking, left behind.

The human ear can safely respond to pressures up to 120 db. Any intensity higher than this is harmful and can conceivably damage the ear. This would be clear, if we examine the functioning of the ear.

The Ear. The ear consists of three parts, the *outer ear*, the *middle ear* and the *inner ear*. The outer ear (*auricle*) collects the sound stimuli. These are carried through a canal to the middle ear. The canal is not straight and is widest where it meets the outer wall of the middle ear, the ear drum. The sweat glands of the canal are modified to secrete a kind of wax-the ear wax. The middle ear is a cavity in the temporal bone which is a part of the skull. The *tympenic membrane* or the ear drum receives the sound vibrations from the outer ear.

Three minute pieces of bone bridge the cavity, the *hammer*, the *anvil* and the *stirrup* (so called from their shapes). These transmit the vibrations received by the middle ear to the inner ear. The inner ear is a small but elaborate structure which houses two distinct organs-one for hearing and the other for

balance. The organ for hearing, called the *cochlea* is a snail-shaped container which transmits sound vibrations as nerve impulses to the brain. It is the brain that initiates the entire system of varied bodily responses to sound.

Thus, the brain activates the pituitary gland which in turn causes the thyroid and adrenal glands to excrete hormones. It stimulates the sympathetic nervous system which influences the heart, the stomach, the pupil, blood vessels and motor nerves which control muscle reactions. These and other reactions determine our bodily responses to sound.

A common misconception is that the ear gets accustomed to excessive noise if it is

heard *continually*. Actually what happens is that the ear progressively loses its sensitivity and ability to transmit sound vibrations to the brain resulting in various degrees of deafness. Such disabilities become markedly noticeable in old age.

Noise pollution. Sound is either music or noise—so goes an old saying. What is implied by this distinction is that whatever is pleasant to the ear is music while all that is unpleasant is noise. Such phrases as 'grating on the ears' or 'jarring on the nerves' express the discomfort we feel on hearing unpleasant sounds. It is such unpleasant impacts of sound that are collectively described as *noise pollution*.

All cities and towns labour under noise

Ultrasonics in Medicine

Ultrasonic beams for diagnosis of internal diseases were first used in cardiology in 1953. The credit for this goes to a Swedish cardiologist, Dr. Inge Edler. Heart surgery had just started and there was hardly any satisfactory method to ascertain the condition of the heart before surgery. X-ray could give little helpful information. Dr. Edler therefore sought the assistance of a Swedish physicist. At that time there was in use an ultrasonic device to detect flaws in castings and weldings. This device was suitably adjusted to check the flaws in the human heart. It proved successful and was quickly taken up by cardiologists all over the world. The ultrasonic diagnosis of the heart gives us an echo-cardiogram. This echogram technique was extended to all kinds of internal diseases.

The simplest device for ultrasonic diagnosis is known as A-scope. The A-scope has clinical applications in neurology, ophthalmology and internal diseases of many types. It enables the physician to measure the depth of the echo-producing surface and to analyse the characteristics of the echoes received.

Ultrasonic beam consists of a train of pulses that are emitted about a thousandth of a second apart. The ultra-sonic beam behaves much as the radar does. Each pulse which is shaped like a tear-drop travels in the beam at the speed of sound and is echoed back by the internal organs. The strength of the echo indicates the nature of the tissues through which the beam passes. If the tissues are soft the echoes are low, if they are hard or bony the echoes are much greater. The echoes sent by the ultrasonic pulses can be recorded and kept for further reference.

Already ultrasonic scanning has proved itself superior to other methods like X-ray scanning in Obstetrics (Pregnancy and delivery) and Gynaecology (diseases peculiar to women). Ultrasonic beams can show very early whether a woman is pregnant or not. They can also identify various pregnancy troubles like excess of amniotic fluid, absence of brain in the foetus and faulty development of pregnancy. They are also useful in locating internal cysts, abscesses and cancers of the liver and to identify aneurysms (bulging of the arteries) particularly of the abdominal aorta. Since ultrasound probes the interiors of glands it can detect abnormal conditions such as tumours or inflammation of the prostate gland. They can also identify breast cancers early enough to bring them under control.

pollution in varying degrees. The worst offenders are the big cities, whose noisy traffic itself is a potent menace to hearing. A study recently conducted in West Germany showed that 2.5 million people (out of nearly 63 million) live in places where the noise level is high. This is a small percentage, as percentages go, but it indicates only those who are exposed to the greatest danger.

It does not mean that others are unaffected by noise pollution. Even noises at much lower levels can be harmful, especially during sleep and recuperation. Anything that disturbs the repose of sleep is detrimental to health in the long run. Barking dogs and fighting cats can interfere with sleep whether in the town or in the country.

Future Doom. During work hours noise is definitely a deterrent to concentration. From 50 db onwards noise can interfere with normal voice communication. At 70 db even normal conversation becomes impossible. However,

some people have become so accustomed to noise that they cannot concentrate on their work in the absence of familiar sounds like the radio. May be, these people do turn out better work in a noisy environment but they are heaping up trouble for the future.

The constant exposure to noise will steadily deteriorate the delicate parts of the middle ear, which would fail more and more in transmitting sound impulses to the inner ear, ultimately resulting in inefficient bodily responses to sound.

A study jointly conducted by the Indian Council of Medical Research and the Department of Science and Technology during the period from 1977 to 1982 showed that more than 10% of the urban population and about 7% of the rural population in India suffer from mild to severe hearing impairment. The fact that a greater percentage of the urban population—almost one and a half times of its rural counterpart—suffer from defective hearing clearly shows the dangers posed by higher noise pollution levels.

5. GALAXIES

Galaxies are huge congregations of stars that hold together by force of gravity. They are so big that they have sometimes been called 'island universes'. Galaxies seem to be scattered in space. But there are many clustered into groups.

When the expanding material of the universe broke up in the first instance, billions of islands of gaseous matter were formed in space. These gaseous islands or *Proto-galaxies* rotated each with its own speed of rotation. Those with very low rotational speeds assumed nearly spherical shapes. Others assumed elliptical forms with varying degrees of elongation, depending on their rotational speeds. Most of these gaseous islands, however had such high rotational speeds that their bodies were flattened out into the shape of discs, from whose edges spiral arms streamed. The centre of the galactic disc was formed by a multitude of proto-stars rotating on regular circular orbits around the centre of the galaxy, whereas the spiral arms were formed by highly diluted, dusty gas streamers which were caught in the general rotation and were twisted into the shape of spirals. The galaxies have thus

come out in different shapes and sizes.

As the gaseous islands were settling down, local condensations—*proto-stars*[†] developed at many points within the galaxy. These condensations began to contract under their own weight into dense gas spheres. As a result of this contraction, the temperature of the gas spheres rose steadily and their heated surfaces began to emit heat waves and then the shorter wavelengths of visible light. As the central atmosphere of these contracting proto-stars reached the ignition point—say 10 million degree centigrade—contraction stopped, thermo nuclear reactions began and millions of bright burning globules of gas emerged—the stars. When the stars appeared, the originally cool and dark proto-galaxies were transformed into the bright stellar galaxies that they are today

[†] See Box 'Orion Molecular Complex'

Structure. A structural analysis of the known galaxies brings out three major forms - *Spiral*, *Elliptical* and *Irregular*. Spiral galaxies have a central nucleus with great spiral arms trailing round it. The Milky Way and the Andromeda Galaxy belong to this group. A special type of spiral galaxies is what are called *barred spirals* which have a central bar as a nucleus. The spirals comprise some 80 per cent of the galaxies so far known. Elliptical galaxies show purely elliptical shapes without any spiral arms. They range in shape from spherical ellipticals to extremely saucer-shaped ones and account for about 17 per cent of the known galaxies. Irregulars, as the name suggests, show no definite geometric pattern of shape.

It has been suggested that irregular galaxies are youthful galaxies, while spiral galaxies represent middle age and elliptical gala-

xies old age.

Peculiar Galaxies. Most of the galaxies show some sort of regularity and symmetry that enable us to classify them. But one or two per cent stand out as peculiar. These galaxies, no doubt, can be counted as irregular galaxies as mentioned above. But their irregularities are so unique and their eccentricities so bizzare that it is best to classify them as *Peculiar Galaxies*.

The first peculiar galaxy was noticed in 1917. It appeared to be a double nebula with long curving tails. In the New General Catalogue (N.G.C.) of 1888, they were numbered as nebulae 4038 and 4039. In 1921 when the photographs of these nebulae were scrutinised, it was found that they sent out long curving filaments which resembled the antennae of an insect. The system has since become known as *Antennae*. The Antennae is about 50 million light years from our galaxy, which among galaxies is not a great distance. Only about 1000 easily recognised galaxies lie closer to ours.

Another pair resembling the Antennae is N.G.C. 4676 A and 4676 B, nicknamed the *Mice*. One of the pair sends out a long straight tail and the other, a curved tail. Another well known pair is the *Whirlpool* galaxy and its companion (M.51). N.G.C. 3921 is yet another peculiar galaxy without any companion at all. It sends out a number of streamers that look like long tails but no second galaxy has been noted anywhere in its vicinity.

Cluster of Galaxies.* Most of the observable galaxies seem to be scattered in space more or less at random but there are numerous cases of galaxies clustering into groups, which may contain as many as several hundred individual galaxies. Our own galaxy, the Milky Way, belongs to a cluster of some 24 galaxies called the 'local group'. This group covers an area of about 3 million light years in diameter.

The two nearest galaxies are the Large Magellanic Cloud and the Small Magellanic Cloud, so called after the world navigator Magellan who first spotted them. The Large

Orion Molecular Complex

This is the name by which the star-forming cloud in Orion (see S.9) is known among astronomers. Stars are formed in dense interstellar clouds first as protostars (see S.4). At this stage they shed no light but are visible in the infra red region. The OMC is the nearest star-forming cloud (to us) being around 1500 light years away. The core of the cloud is around 2 light years across and contains (1) ionised gas with a density of 10,000 atoms per cubic centimetre, (2) a cluster of hot massive luminous stars, (3) a dense cloud of molecular gas of high density, (4) a cluster of infra red stars which are optically invisible and (5) exotic objects spewing out intense waves of micro wave radiation called 'maser emission'.

It was in this cloud complex that the first claim for the discovery of a protostar emitting profusely in the infra red was made in 1967. This young infra red object emits infra red radiation, equivalent to 10,000 times the total radiation from the sun, but is completely dark in the optical region. This is often referred to as the BN object after its discoverers—Becklin and Nagebauer.

* There is an unfortunate confusion of terminology between **Clusters of galaxies** and **galactic clusters**. The latter are the clusters of stars within the spiral arms of the galaxies (see *Constellations* infra.)

Cloud is about 155,000 light years from us with a maximum diameter of some 40,000 light years and contains some 5 to 10 billion stars. The Small Cloud has only a population of 1 to 2 billion stars.

The two largest galaxies in the group are the Milky Way and the Andromeda galaxy, both of them spiral. Andromeda's galaxy (M 31) is of special interest to us, because it appears that our galaxy and M 31 are actually approaching each other at a rather modest speed, some 50 km per second.

Local Group. The Local Group is a term loosely applied to indicate our galaxy and its nearby galaxies. The Group now (1980) numbers around two dozen. Some like the *Maffei* are even suspected to be outside the group.

The latest known member of the group is a *dwarf galaxy* discovered by the Siding Spring Observatory in Australia. It is in Carina and consists of a loose swarm of very faint stars. In appearance it resembles the Sculptor and the Fornax systems. It is estimated to be about 500,000 light years away.

Supercluster. Scientists at the Kitt Peak National Observatory, Tucson, Arizona, U.S.A. say they have spotted a supercluster of galaxies that is believed to be the largest known entity in space.

The cluster of galaxies is one billion light years long, said Jack Burns, a University of New Mexico astronomer. A light year is almost six trillion miles.

Scientists believe that formation of such a cluster would require more gravitational force than has previously been attributed to all the galaxies and stars known to humans, Mr. Burns said.

"The universe must be dominated by some form of dark or unseen matter," he said. That matter, he added, could be made of the exotic particles predicted recently by high energy physicists.

The largest supercluster previously found was about 700 light years long and was reported in 1982 by Cornell University scientists, he said.

He said the age of the universe would limit how large superclusters could grow because they take so long to form. - AP: July 21, 1985.

Galaxies

Galaxy Name or Number	Visual† magnitude	Distance (kilopsc)	Diameter (kilopsc)	Absolute magnitude
The Milky Way	-	-	30	(-21)
Large Magellanic Cloud	0.9	48	10	-17.7
Small Magellanic Cloud	2.5	56	8	-16.5
Ursa Minor system	-	70	1	(9)
Sculptor system	80	83	2.2	-11.8
Draco system	-	100	1.4	(-10)
Fornax system	8.3	190	6.6	-13.3
Leo II system	12.04	230	1.6	-10.0
Leo I system	12.0	280	1.5	-10.4
NGC 6822	8.9	430	2.7	-14.8
NGC 147	9.73	570	3	-14.5
NGC 185	9.43	570	2.3	-14.8
NGC 205	8.17	680	5	-16.5
NGC 221 (M 32)	8.16	680	2.4	-16.5
IC 1613	9.61	680	5	-14.7
Andromeda galaxy	3.47	680	40	-21.2
NGC 598 (M 33)	5.79	720	17	-18.9
Maffel I	11.0	1000	-	-19.0

† For Visual and Absolute magnitudes, See **Magnitudes** infra

6. THE MILKY WAY

The Milky way is our home galxy. A peculiar feature of this galaxy is a bright band of light that runs almost in a perfect circle through it. Milky way belongs to a cluster of some 24 galaxies called 'the local group'.

As seen from the earth this band looks like a river of light flowing through the sky. Actually it is made up of millions of scintillating stars which from this distance seem to be placed in close proximity to one another. Modern westerners have called this river of light the Milky Way. The name is now applied to the galaxy as a whole.

The Milky Way had so fascinated our ancestors among all nations that they had given it pretty names and had woven fanciful legends about it. The Yakuts of Central Asia called it the footprints of God and the Eskimos the path of white ashes. The ancient Greeks called it the road to the palace of the Heavens, the Chinese, the celestial river and the Hebrews, the river of light. The ancient Indians, not to be outdone called it the Akash Ganga or the Celestial Ganges.

Akash Ganga. Legend has it, that in response to the insistent prayers of a devotee Bhagiratha, God Siva brought the Akash Ganga down and allowed a trickle of it to fall on the Earth. This trickle formed the earthly Ganga (River Ganges), which thus remains even today, sacred to Hindus all over the world.

The Milky Way is a spiral galaxy. The main body of the galaxy is a disc 100,000 light years across with a globular nucleus of about 16,000 light years in diameter, and far-stretching spiral arms (in one of which our solar system is located). The galaxy consists of over a hundred billion stars rotating about the centre in a stately average period of some 230 million years.

The principal gravitational force that controls this rotation is produced by the star clouds at the centre which have a total mass of about 50 billion suns. The mass of the entire Milky Way is calculated to be a little

more than 100 billion times the mass of the Sun.

The stellar population of the Milky Way is made up of three categories of stars. First, there are the stars in the hub and spirals of the Milky Way. The sun belongs to this group of stars. These groups are called *Open or galactic clusters* (see *Constellations*). Beyond the disc and the open clusters, lie the halo stars. Many of these stars form miniature galaxies, containing tens of thousands of stars. These are called *globular clusters*. They contain very old stars. Beyond the globular clusters there are several million individual stars, that run round rakishly on the outskirts of the Milky Way. All these form part of the galaxy.

Re-shuffling of Stars. The stars in the galaxy are being continually reshuffled. In the course of a million years, two stars now close together but having a difference in velocity of one kilometre per second, will have separated by 3 light years. Therefore, in less than one *Cosmic year*† (250 million years) some groups of stars may disintegrate and new groups of stars may form. The physical make-up of the galaxy is also likely to change over intervals of the order of a cosmic year.

Galactic Nucleus. The centre or the nucleus of our galaxy is so completely obscured by dust clouds that we cannot learn anything about it through optical telescopes. What little we know about the nucleus has been collected by radio telescopes.

Our galactic nucleus is about 32,000 light years from the Sun. It appears to be a rotating disc of gas. In this rotating disc massive activities are going on. One such scene o

† See *The Sun* infra.

activity is very near the centre of the galaxy. Here, new stars are being born continually. The area is already crowded with full grown stars. The stellar density here is of the order of a million stars per cubic parsec (3.26 light years). It means that while we on earth, can see only one really bright star (Sirius) at night, any watcher in the central disc can see a million stars like Sirius, with a total luminosity of about two full moons. That is to say, the centre of our galaxy is perpetually

flood-lit.

Dr. Joseph Weber of the University of Maryland thinks that a Black Hole* dominates the centre of our galaxy. One of his experiments showed powerful gravity waves emanating apparently from our galactic centre. Strong gravity waves are generally associated with Black Holes. It is therefore quite possible that a Black Hole is holding our galaxy in its murderous grip.

7. STARS

Stars account for 98 per cent of the matter in a galaxy. The rest 2 per cent consists of interstellar or galactic gas and dust in a very attenuated form. The normal gas-density between stars (interstellar gas) throughout the galaxy, is about one-tenth of a hydrogen atom per cubic centimetre (cm³) volume.

Stars tend to form groups. Lone stars going on their own are the exception rather than the rule in the universe. Single stars do not number more than 25 per cent of the stellar population. Double stars account for some 33 per cent. The rest are multiple stars. Antares in Scorpio is actually two stars. Capella and Alpha Centauri comprise three stars each, while Castor consists of six stars.

Binaries. Stars which appear single to the naked eye are sometimes found to be double stars or binaries in the telescope. These are two stars revolving around a common centre of gravity. They are found in orbital motion round each other, in periods varying from about one year to many thousands of years.

When the hydrogen in a star is depleted, its outer regions swell and redden. This is the first sign of age. Such stars are called Red Giants. Our star, the Sun, is expected to turn into a red star of this type in another 5 billion years. (See *Sun* infra).

Red Giants are appropriately named. They have gigantic dimensions. Betelgeuse, for example, has an actual diameter of 300,000,000 miles, about 350 times the diameter of the sun. Mira, another red giant, has a diameter of 400,000,000 miles.

Variable stars. These are stars that

show varying degrees of luminosity. *Delta Cephei*, the first of this type of stars, was noticed in 1784 by the deaf and dumb English astronomer John Goodricke. He found that Delta Cephei had a regular fluctuation of brightness every 5 days and 9 hours. Stars of fluctuating luminosity, thus came to be called *Cepheid Variables*. In stars of this type, high luminosity fluctuates between periods as small as a few hours to as long as 1000 days or more. Generally speaking, the slower the bright-dull-bright cycle, the higher is the luminosity.

Novae & Supernovae. These are stars, whose brightness increases suddenly by 10 to 20 magnitudes or more and then fades gradually into normal brightness. The distinction between the two types has not been precisely explained. It would appear that they differ in degree and not in kind. The sudden increase in brightness is attributed to a partial or outright explosion. In novae, it seems that only the outer shell explodes, whereas in supernovae the entire star explodes. Novae occur more frequently than supernovae.

Supernovae are stars whose brightness increase to 20 magnitudes or more. As Prof. C. F. Powell puts it, "The whole structure of the star is blown to pieces, it flares up in

* See *Life of a Star* infra.

brilliance" so that its intrinsic luminosity for the first thirty days following the explosion is equal to about 1000 million of our suns."

About one star in 100 explodes like this. In our galaxy of some 100 billion stars, a supernovae explosion may occur once every hundred years. An exploding star or supernova releases more energy than a billion suns and ejects a lot of matter into space, at a velocity very near to the velocity of light. Some supernovae may leave a super dense core which rotates at high speed and may thus transform itself into a pulsar.

Four supernovae had been identified in historical times, all before the invention of the telescope. They were noted in 1006, 1054, 1572 and 1604.

The 1006 and 1054 supernovae were identified by oriental astronomers. The 1006 supernova appeared towards the end of April 1006, in the constellation of Lupus. Initially, the star was as bright as Venus. It continued to be visible at night for longer than a year. Although no visible remnant of this supernova is traceable, radio emissions from its remnant were identified in 1965. The 1054 supernova, of which detailed descriptions survive in Chinese chronicles, is described "as a guest star". It is said that this supernova outshone the sun for many days and turned night into day. The Crab nebula is taken to be the remnant of this supernova.

The supernovae of 1572 and 1604 were noted by two European astronomers, Tycho Brahe and Johannes Kepler. According to Tycho, the 1572 supernova was brighter than any other fixed star and even brighter than Jupiter. The remnant of this supernova was not traced until 1952. Later, the remnant was located as a strong source of X-rays. The

Nearest Stars

Name/Number	Distance (light years)	Magnitude*	
		Appa- rent	Abso- lute
Proxime Centauri	4.2	10.5	15.5
Alpha Centauri	4.3	0.06	4.7, 6.1
Barnard's Star	6.2	7.7	13.4
Lalande 21185	8.0	7.6	10.7
Wolf 359	8.1	13.5	16.5
Sirius A	8.7	-1.58	1.3
Inne's Star	9.6	11.7	14.4
B.D.-12 degrees			
4523	9.9	9.5	12.1
Kapteyn's Star	10.2	9.2	11.7
Ross 248	10.2	13.8	16.3
Ceti	10.2	3.6	6.1
Procyon	10.4	0.48	3.0
Eridani	10.5	3.8	6.3
61 Cygni	10.7	5.6	8.0
Lacaille 9352	11.2	7.4	9.7
2398	11.3	8.8	11.1
Groombridge 34	11.6	8.1	10.4
Indi	11.6	4.7	6.9
Kruger 60	12.5	9.3	11.4
Van Maanen's Star	12.8	12.3	14.3

supernova of Kepler (1604) attained a brightness equal to, if not greater than, that of Jupiter. It was visible by day for a month and by night for a whole year. The remnant of this supernova has also been identified as a radio source.

The most recent supernova explosion in our galaxy took place in 1700 in the constellation of Cassiopeia. Strangely enough, this explosion had not been noticed by any astronomer. This supernova was identified in 1948 from its relic, an intense radio source named Cassiopeia A.

8. MAGNITUDES

Magnitudes represent a measure of brightness. Apparent magnitude is the measure of brightness (visual magnitude) which is observed from the Earth. Absolute magnitude is the brightness which a star would have at 10 parsec's distance. (A parsec is equal to 3.26 light years).

Classification of years by magnitudes or by a scale of brightness was first made by Hipparchus, a Greek, in the second century B.C. He divided stars into 6 groups according

to degrees of brightness, observable by the naked eye. The brightest star belonged to the first magnitude and the faintest to the

* See *Magnitudes* infra.

sixth. This scale of brightness, as perceived by the human eye, worked out at a ratio of 2.5 between magnitudes, that is to say, stars of the first magnitude were 2.5 times brighter than stars of the second magnitude and so on.

The scale was adopted by modern astronomers in 1856. But the ratio between magnitudes was made more accurate at 2.512. A difference of 5 magnitudes thus showed a ratio of 100 to 1 in brightness.

The star *Aldebaran* was taken as representing a brightness of 1.0 magnitude. The magnitudes of other celestial bodies were measured in terms of this unit. The magnitudes of stars brighter than *Aldebaran*, were indicated by the minus sign and stars of lesser magnitudes by the plus sign. Thus the higher the negative number (minus sign) the brighter the star, and the higher the positive number (plus sign) the fainter.

We have to be on our guard against judging the true brightness of stars by their apparent brightness. Thus our Sun appears to be about 40 million times brighter than *Aldebaran*. But the Sun is only a few minutes

Magnitude and Brightness

Difference in Magnitude		Ratio of light
0	-	1:1
0.5	-	1.6:1
1	-	2.5:1
2	-	6.3:1
5	-	100:1
10	-	10,000:1
20	-	100,000,000:1
40	-	10,000,000,000:1

away (8 min. 16.6 sec. in terms of the light year) while *Aldebaran* is 53 light years away and is actually a hundred times brighter than the Sun. Or take two other stars *Sirius* in *Canis Major* and *Canopus* in *Carina*. To the naked eye, *Sirius* appears to be twice as bright as *Canopus*. But *Sirius* is only 8.7 light years distant, while *Canopus* is 100 light years away. This means that *Canopus* shines many times more brightly than *Sirius*.

The Brightest Stars

Constellation	Star	Distance (light years)	Colour	Brightness Sun = 1
Centaurus	Alpha Centauri	4.3	Yellow	1.5
	Beta Centauri	300	Blue-White	5000
Canis Major	Sirius	8.7	White	23
Canis Minor	Procyon	11.3	Yellow-White	7.3
Aquila	Altair	16.5	White	11
Piscis Australis	Fomalhaut	23	White	14
Lyra	Vega	27	White	55
Bootes	Arcturus	36	Orange	110
Gemini	Castor	45	White	27
	Pollux	40	Orange	45
	Capella	47	Orange	170
Taurus	Aldebaran	53	Orange	100
Endanus	Achernar	65	Blue-White	200
Leo	Regulus	75	Blue-White	120
Carina	Canopus	100	Yellow-White	1500
Virgo	Spica	260	Blue-White	2800
Scorpius	Staula	300	Blue-White	1700
	Antares	400	Red	5000
	Bellatrix	360	Blue-White	2300
Orion	Betelgeuse	500	Red	1700
	Rigel	800	Blue-White	40000
	Deneb	1400	White	60000
Cygnus				

9. CONSTELLATIONS

Stars forming a group are called Constellations. Many of the constellations are only seemingly so. A number of stars appear to form a group because some happen to be almost behind the others in our line of vision.

Many stars and groups of stars, forming apparent constellations have been named after legendary heroes or called after familiar forms and animals. Some names like *Corona Borealis (the Northern Crown)*, *Cygnus (the swan)* and the seven stars in *Ursa Major, known as the Plough*, bear some semblance to the figures or things they are supposed to represent. Many others call for a highly extended imagination in order to connect their shapes with their names.

Star Clusters. There are two types of star groups. The first group called *open* or *galactic clusters* are groups of up to two or three hundred stars which are found in the spirals of the Milky Way. The open clusters visible to the naked eye are the *Pleiades*, the

Hyades and the *Praesepe*. Of these, the finest spectacle is the *Pleiades* which glitter like a swarm of fireflies tangled in a silver braid. The *Pleiades* consist of some 200 stars, of which we can see some 12 or 14 without the aid of mechanical devices.

The second group, called *globular clusters*, contains over one hundred thousand stars and represents the outer stellar population of the Milky Way.

In 1928 the International Astronomical Union recognised 88 constellations. These constellations are mainly used to describe the location of stars and the positions of comets, meteors or other heavenly bodies. Obviously, it is easier to speak of a star in *Aquila* or *Orion* than to describe its exact astronomical position.

10. LIFE OF A STAR

Stars are formed by gravitational contraction from vast clouds of galactic gas and dust. Star-forming clouds are thousands of times denser than the normal interstellar gas. They have a density going up to 1000 hydrogen atoms per cubic centimeter. Many such pre-star clouds are visible in our own galaxy, the nebula in Orion, being one.*

The life of a star is spread over billion of years. Stars start life as condensing masses of gas. As condensation progresses, individual atoms are drawn towards the centre by force of gravity. They pick up speed as they fall to centre. According to the speed of the fall, they increase their energy which tends to heat the hydrogen atoms. When this process goes on for some millions of years, the heat goes up to about 10 million degrees centigrade. At this temperature the hydrogen in a star ignites and begins to burn in a series of

nuclear reactions. This marks the birth of a star.

Nuclear Fusion: The nuclear reaction in a star is called *nuclear fusion* which goes on in all the stars, all the time. This means that lighter atoms are split up and reconstituted into heavier atoms. Thus at about 10 million degrees centigrade, hydrogen atoms fuse together to form helium. Four protons of hydrogen combine to make one nucleus of helium and two nucleus of positrons

* See Box 'Orion Molecular Complex'

($4\text{H} \rightarrow \text{He} + 2\text{e}$). When all the hydrogen in the star is converted to helium, the star begins to shrink and becomes smaller in size. As it gets smaller, temperature rises. When the temperature reaches 100 million degrees more complicated nuclear reactions occur.

Three nuclei of helium combine to make one of carbon ($3\text{He} \rightarrow \text{C}$). One nucleus of carbon combines with one of helium to make oxygen ($\text{C} + \text{He} \rightarrow \text{O}$). As the star shrinks further and the temperature rises to say 2000 to 4000 million degrees, highly complicated nuclear fusions occur. Carbon and oxygen combine to form iron, magnesium, silicon and other heavy elements.

When the hydrogen in a star is converted into heavier atoms like helium, the density of the star increases manifold and the star is well nigh dead. The core of a dying star contains the densest matter in the universe†. The ultimate density of a star, according to present theories, is that it will turn into one of three things- according to its mass- *White Dwarfs*, *Neutron Stars or Pulsars* and *Black Holes*.

If the star is about the mass of the Sun or less than that, it will turn into a white dwarf. If the star is bigger than the Sun but not more than twice as big, it will turn into a neutron star or pulsar. If the star is many times bigger than the Sun, it will turn into what is called a *Black Hole*.

White Dwarfs. Stars lighter than 1.2 solar mass tend to die as white dwarfs. The white dwarfs are no bigger than the Earth (around 6000 km radius) but their central density is so great that it can reach 10^8 grams per cubic centimeter. This means that a teaspoon of its material will weigh as much as a ton. In white dwarfs, the enormous contracting pull of gravity is balanced by the pressure created by the rapidly moving electrons.

White dwarfs are distinguished by their high luminosity and high surface temperature. A white dwarf will continue for millions of years generating heat and light. But it will

steadily cool down and ultimately turn into a *black dwarf*, emitting neither heat nor light. It will thus be reduced to cinder and consigned to the ash-heap of the Universe.

Neutron Stars: Stars whose mass is between 1.2 times and something less than 2 times the mass of the Sun, turn into Neutron Stars or Pulsars. Neutron Stars are so called because they are made up, almost entirely, of atomic particles called *neutrons*. In a neutron star, matter is compressed until it approaches the density of matter within an atomic nucleus, about 10^{14} grams per cubic centimetre. A teaspoon of neutron star matter would weigh a billion tons. This is a density, a billion times greater than the density of white dwarfs.

The collapse of a big star into a neutron star happens in a matter of seconds. The shock wave of collapse, coming from the interior, blasts the outer layers of gases in the star into space. This would look like the explosion of a nova. After the explosion the star shrinks.

In the shrunken neutron star left by the explosion, gravitational energy would raise the temperature to many millions of degrees. Yet, the outer crust of the star, about a kilometre thick, remains unaffected and does not melt. It is a fantastically solid and rigid crystalline material, 10^{15} times stiffer than steel. Inside, the neutrons form a *Super fluid** with almost no viscosity.

Calculations show that an object as dense as a neutron star must also have a prodigious gravitational power- a hundred billion times that of the Earth. So strong is the gravitational pull that a mountain on the surface of a neutron star would not rise higher than an inch. All the energy that a man can put out in a lifetime would not be enough to climb that one-inch mountain. It is estimated that as many as 100 million of the 100 billion stars in our galaxy, must have burnt themselves out and collapsed into neutron stars.

Pulsars: It is now agreed among astronomers that pulsars are fast rotating neutron stars. Pulsars were first noticed by British astronomers in Cambridge in 1961. They are distinguished by the fact that they send out radio waves in regular frequency, like the ticking of a clock. By 1969 some three dozen

† **Note:** Constituents of matter are a function of density. At a density beyond 10^8 grams cm^3 (10^6 is million and 10^{12} is million million) electrons become so energetic, that they combine with protons in nuclei to form neutrons. Beyond 3×10^{11} grams cm^3 the nuclei begin to liberate neutrons. At around 3×10^{14} grams cm^3 , nuclei break up into separate protons and neutrons and so on.

* See Cryogenics infra

pulsars were located. The discovery of the Pulsar NP 0532 in the Crab Nebula in 1968 represented a major breakthrough. This pulsar sent out radio waves at the remarkably short radio period of 0.033 second. It is presumed that this pulsar is a survival of the supernova explosion of A.D. 1054 which formed the Crab Nebula.

The Crab Nebula pulsar (NP 0532) shows signs of slowing down, at the infinitesimal rate of about one part in 2500 in a year. This means that the pulsar is slowly decaying as it uses up its energy. Meanwhile, it pours out radiation at a stupendous rate—about 10,000 times the radiation of the Sun.

NP 0532 is not the only pulsar, known to be associated with an old supernova. PSR 0833-45 discovered by Australian astronomers in 1968, pulsates every 0.089 second. This has been located in the Vela Nebula which is considered to be the debris from an unrecorded supernova explosion, several thousand years ago. The rate of pulsation of the Vela pulsar is gradually lengthening, a property shared by other observed pulsars. It is also noticed that the pulsation of the Vela Pulsar, tends to become irregular. Such behaviour indicates that the pulsars could not safely be used as precise time-keepers.

Black Holes is a misleading term because what they represent are not holes at all. On the contrary, they are stars, which have contracted so much that they have developed super density, 10^{16} grams per cubic centimetre. This represents a density greater than the ultra-density of white dwarfs (10^3 grams cm^3) and neutron stars (10^{14} grams cm^3). The black hole is the destiny of all stars, whose mass is considerably greater than the mass of the Sun. They are so compact and their gravitational pull so strong, that even light or radiations produced by them cannot escape them. So they cannot be seen by optical telescopes.

Black Holes were predicted by Einstein's general theory of relativity. The theory is this. If a given mass is condensed into progressively smaller radii, its gravitational influence becomes so strong that below a critical radius the radiation emitted by the object can no longer escape from it. This critical value of the radius is called the *Schwarzschild radius* after the German astronomer, Karl Schwarzschild who first obtained

The Fastest Pulsar

The fastest rotating pulsar, which rotates 600 times per second, or more than twenty times faster than any other known pulsar, has been discovered by a team of astronomers led by Dr. Donald C. Baker of the Radio Astronomy Laboratory of the University of California, Berkeley. The team includes an Indian graduate student, Shrinivas Kul-karni.

The newly identified pulsar, located about 5000 light years from the Earth in the constellation Vulpecula, may be only three or five kilometres in diameter. But, its mass could be two to three times that of the Sun. The energy output of the new pulsar may be ten to hundred million times that of the Sun, but no one knows how most of that energy is dissipated. -Science Today.

the solution of Einstein's field equations for a spherical mass in 1916. The Schwarzschild radius for the Sun would be about 2 miles. An object, with the Schwarzschild radius is referred to by astronomers as a 'Black Hole' since it cannot be seen by a distant observer.

A Black Hole is an awesome phenomenon. It is the smallest and the densest object in the Universe. Its gravitational power is incredible. It can swallow up everything near it and nothing that gets into it can ever escape from it. It can neither crack nor split nor decrease in size. It can only grow and nothing in the Universe can stop it from growing. This is a foreboding prospect.

The Black Hole is a collapsed star or as some would call it a *Collapsar*. The collapse of the star or its transformation into a Black Hole is quick and invisible. The star merely winks out and is never seen again. But although invisible, it exerts a terrific influence over everything around it.

We do not know what is inside a Black Hole or what goes on within its bowels. It is, however, believed that a Black Hole has a perfectly smooth surface without any ups or downs. A Black Hole cannot be identified by any direct means. Indirect evidence is however, available. It is its enormous gravitational power that gives it away.

Cygnus X-1. One such Black Hole, recently identified, is a powerful but invisible

X-ray object, called Cygnus X-1. It has been spotted by satellites which carried X-ray telescopes. Cygnus X-1 is paired with a super star, (HDE 226868) which is visible. The unseen Cygnus X-1 is drawing out a stream of gases from its visible companion. The stream of gas spirals around the Black Hole. One end of the spiral ultimately disappears into the Black Hole. What is happening is that Cygnus X-1 is bleeding its companion a big blue star, to death. As the gases spiral in towards the Black Hole, they collide, compress, heat up high temperatures and send out intense X-rays. It is these X-rays that have indicated the presence of a Black Hole in the vicinity.

This Black Hole is estimated to be about the size of three Suns. On the face of it, this appears to be a small size for a Black Hole

which is capable of swallowing up whole galaxies. But this size is the Schwarzschild size. When our Sun is reduced to the Schwarzschild size, it will have a radius of about 2 miles only. Cygnus X-1 has a Schwarzschild radius 3 times the present radius of the Sun. This is big enough to absorb galaxies.

Some scientists suggest that the centre of our galaxy is occupied by a Black Hole. *Dr. Kip Throne of the California Institute of Technology, a leading authority on collapsed stars, thinks that ultimately this Black Hole, if it exists, will eat up the whole matter in our galaxy. He says, "We would like to sweep this fact under the carpet, but occasionally, we drag it out, look it in the face and shudder"†

11. QUASARS

Quasars or Quasistellar Radio sources are, as the name implies, part-star and part-radio objects. These were originally considered stars, and later classified as radio-galaxies, that is, galaxies that emit radiation at radio frequencies.

In 1960 it was found that these objects were not mere radio galaxies, but were unique objects which combined the characteristics of stars and radio galaxies. They were therefore named *Quasistellar Radio Sources or Quasars*

In 1965, it was noted that many of the so-called quasars were quiescent, that is, radio-quiet. In fact, it turned out that the majority of quasars were radio-quiet. Such quasars were named *Quasistellar Objects or Q.S.O.*

Discovery. The first quasar was discovered, or identified, by Thomas Matthews and Alan Sandage (US) in 1960. It was a star-like object numbered 3C48 in the Third Cambridge Catalogue and was supposed to be a radio galaxy. In 1963, another quasar, numbered 3C273 was identified. Like 3C48, this was also originally classified as a radio galaxy.

More quasars have been identified since. Though many objects are suspected to be quasars, only about 350 have been confirmed as such till recently. These are compact blue

objects that emitted radiation strongly in the ultra-violet as well as the radio portion of the spectrum. They exhibited many peculiarities like fluctuating brightness and large red shifts.

Far Away Bodies. Though quasars appear to be small objects from the earth, they are gigantic bodies, many of which are suspected to be galaxies. They are, for the most part, situated between distances of 1500 million and 4500 million light years. Astronomers begin to wonder whether the quasars guard the very edges of the universe. *Edge* here indicates not space but time. Because light travels at 186,000 miles per second, the farther away an object is, the longer its light takes to reach our telescopes.

To look out therefore means looking back in time too. As astronomers look out farther and farther into space, they are also seeing farther and farther back in time. The farthest that we can see back into time, is what is often described as the edge of space-in time,

* See the Milky Way, Supra

† Also see the Quasars, infra.

that is. In the words of Prof. John Wheeler of Princeton "Quasars are beacons that light up the far away and the long ago"

In 1973 American astronomers discovered a quasar, nearly 12 billion light years away. This was supposed to be the farthest quasar. However, the quasar designated PKS 2000-330 is, according to some, the farthest quasar so far (1983) known. It has a red shift of 3.78 which implies, it is receding from us at 92% of the speed of light. This enormous recessional velocity is probably an effect of the Big Bang. "If it is, PKS 2000-330 is more than 16 billion light years from our galaxy....light now reaching the earth from this quasar must have been emitted shortly after the Big Bang." *Scientific American*

Profuse Energies. A typical quasar, say about the size of the Solar System, produces the energy of 10 trillion Suns or 100 galaxies. Some quasars shoot jets of gas thousands or millions of light years into space at speeds almost as fast as light and then stop for a time, only to re-ignite the fires in a few weeks or days or even in just a few minutes. Some blare forth in radio waves, while others spurt forth X-rays or nestle in a fiery glow of infra red (heat) radiation. It is not known what

secret fountains provide such prodigious supplies of energy.

One thing is obvious. Such profuse expenditure of energy must shorten their life periods. Most of the quasars, whose light reaches us now must have died out millions of years ago. The average age of a quasar is estimated at about a billion years, while many stars live through billions of years.

Quasars are the the fastest receders so far known. Their speed of recession ranges from 15% to over 90% of the velocity of light (see above).

Quasar Population. The quasar population of the universe is estimated to have been about 14 million, in the first instance. As the life-time of a quasar is short, many of these quasars must have degenerated into less luminous, less active objects, perhaps into ordinary galaxies. We know of their existence in the past, because the signals they emitted billions of years ago are only now reaching our telescopes.

To-day the total population of quasars (including the radio-quiet QSOs) may be estimated at about 1.5 million. Out of these about 35,000 may be reckoned as radio emitting quasars.

12. SOLAR SYSTEM

The solar system is centred in the Sun. The Sun is the head of a family of 9 planets—Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptun and Pluto—not less than 46 satellities accompanying the planets, hundreds of asteroids and thousands of comets.

The Solar system is tucked away in a corner of the Milky Way at a distance of about 30,000 to 33,000 light years from the centre of the galaxy.

The solar system originated in a primitive solar nebula—a rotating disc of gas and dust. It is from this rotating disc that the planets and the rest of the solar system evolved.

Planets. The term *planets* is derived from the Greek word *planetes*, meaning wanderers. Unlike the stars, which are visible in their fixed positions in the sky always, the planets shift their positions and sometimes even disappear from view.

Therefore they came to be called planets or wanderers. The first known planets were named after the Roman gods—*Mercury, Venus, Mars, Jupiter* and *Saturn*. The other planets, when they were discovered later, were also named according to the old pattern—*Uranus, Neptune* and *Pluto*.

The planets are divided into the inner planets and the outer planets. The inner planets are Mercury, Venus, Earth and Mars. The Earth is the largest of the inner planets and the densest of all planets. All the inner planets are dense rocky bodies and are collectively called *terrestrial planets*.

because they resemble the Earth. The outer planets, Jupiter, Saturn, Uranus and Neptune are very big, with large satellite families. They are composed mostly of such elements as hydrogen and helium. These planets are called Jovian, after Jove, the Greek name for Jupiter, because they resemble Jupiter in many things. All of them rotate furiously, wear dense atmospheres and consist of far

higher elements than the earth like or terrestrial inner planets.
The outermost planet Pluto is in a class by itself. It is supposed to be a dense planet like the inner planets, although it is the farthest of the outer planets.

Rotating on their own axes, the planets revolve round the sun in long elliptical orbits.

Solar System-Planets

	Mercury	Venus	Earth	Mars	Jupiter	Saturn	Uranus	Neptune	Pluto
Mean Dist. from the Sun (million km)	57.9	108.2	149.6	227.9	778.3	1427	2869.6	4496.6	5900
Mean Dist. from the Sun (Astronomical Units) (Earth=1)	0.387	0.723	1	1.254	5.203	9.539	19.18	30.06	39.44
Period of Revolution	88 days	224.7 days	365.26 days	687 days	11.86 years	29.46 years	84.01 years	164.8 years	247.7 years
Period of Rotation	59 days	-243 days*	23 h 56 m. 4 s.	24 h 37 m. 23 s.	9 h 50 m. 30 s.	10 h. 40 m.	-11h.*	16 h. 6 days	9 h. 9 h.
Inclination of Axis (degrees) Equatorial	28	3	0	1.9	1.3	2.5	8	1.8	17.2
Diameter (km)	4880	12104	12756	6787	142800	120000	51800	49500	6000(?)
Mass (Earth=1)	.055	.815	1	108	317.9	95.2	14.6	17.2	1(?)
Volume (Earth=1)	.06	.88	1	.15	1316	755	67	57	1(?)
Density (water=1)	5.4	5.2	5.5	3.9	1.3	.7	1.2	1.7	(?)
Surface Gravity Earth=1	.37	.88	1	.38	2.64	1.15	1.17	1.18	(?)
Satellites known	0	0	1	2	16	17	5	4	0

* Retrograde

13. OTHER PLANETARY SYSTEMS

A question that has intrigued astronomers and laymen alike, is whether there are other planetary systems, like the solar system, in the universe. Many astronomers think that now they are well on their way to answer this question in the affirmative.

The sun is an ordinary star, and has been formed in much the same way as other stars. It therefore stands to reason, that if the sun has planets, many other stars must have them too.
The difficulty has been to gather optical or radio evidence to substantiate this theoretic-al assumption. For, the nearest stars are many light years distant. Their planets, if they

have any, will be far too small for our most powerful telescopes. And planets, as a rule, are not radio sources. However, indirect evidence is available to show that at least 3 stars out of the 12 nearest to the sun have some sort of a planetary system.
The following is a list of stars, near to the sun, which are supposed to possess planet-ary systems like our own.

Star	Distance (million Light years)	Planet (Mass- Jupiter=1)
1. Barnard's Star	6.1	15
2. Lalande 21,185	7.9	10
3. 61 Cygni	10.7	8
4. BD+5 degrees 1668	12.4	20 (?)
5. CI2354	15.1	20 (?)
6. BD+20 degrees 2465	15.5	20 (?)
7. BD+43 degrees 4305	15.7	20 (?)
8. CIN 2347	25.5	20 (?)

Barnard's Star. Barnard's star, some 6 million light years from the earth, is one of the

first stars noted by the astronomers, as being likely to have a planetary system like our own. In 1974 two Canadian scientists, Oliver Jensen and Tadenz Ulrich, claimed in the *Astronomical Journal* that Barnard's Star has five planets orbiting it. They have masses ranging from 0.7 to 1.6 times the mass of Jupiter, the largest planet in the solar system. Orbiting distances from Barnard's star are calculated to be between 0.95 and 4.7 times the Astronomical Unit.

None of the planets, however, is likely to have terrestrial conditions because Barnard's star is a feeble dwarf only $\frac{1}{4}$ the mass of the sun and it shines but faintly on its planets.

It looks likely that the Milky Way, with its 100,000 million stars, will have several million planets too. And this goes for other galaxies as well.

14. THE SUN

The Sun is one of the stars in the Milky Way. Modern estimates place the Sun at a distance of about 32,000 light years from the centre of the galaxy. The Sun and the neighbouring stars generally move in almost circular orbits around the galactic centre at an average speed of about 250 km per second.

The Sun at this rate takes 250 million years to complete one revolution round the centre. This period (250 million years) is now called a *cosmic year*.

Red Giant. Like all other stars, the Sun is composed mainly of hydrogen. Its energy is generated by nuclear collisions in its interior. It is calculated that the sun consumes about a trillion pounds of hydrogen every second. At this rate, it is expected to burn out its stock of hydrogen in about 5 billion years and turn into a red giant. The prospect is frightening.

When the sun turns into a red giant, it would have swelled a hundred times in diameter and increased a thousand times in brightness—bright red. It will then occupy about 25 per cent of the horizon. The nearest planets, Mercury and Venus, would melt. The oceans of the earth would evaporate and disappear. The earth would remain a barren rock, heated to the melting point of lead. All life on earth would cease. The Sun will survive as a red giant, for about a hundred

million years more, slowly dissipating its enlarged outer shell leaving a tiny core. This core will be a faint, white dwarf-sun no larger than the present planet Mars. Around this tiny star, the burnt-out earth will continue to revolve.

Structure. The glowing surface of the sun, which we see, is called *Photosphere*. Above the photosphere, is the *Chromosphere*, so called because of its reddish colour. Beyond this layer is the magnificent *Corona* of the sun which is visible during eclipses.

Between the chromosphere and the corona, spectroscopic investigations have identified a distinct, very narrow boundary zone known as the transition region. The temperature of the photosphere is about 11,000°F; that of the chromosphere about 18,000°; that of the transition region about 180,000°; and that of the corona, which extends far into space, about 2,700,000°, hot enough to emit X-rays. (The density of the gas in each layer decreases with increasing altitude, just as the

earth's atmosphere thins with height. The corona, accordingly, is the least dense of the Sun's layers)*.

At the core of the sun where thermonuclear reactions take place the temperature level is around 15 million degrees K. The density at the core is estimated at a hundred times that of water. Outside the core is the convection zone. Here, like the boiling water in a kettle, turbulent motions of gases transport the energy that is generated in the core towards the photosphere.

The visible white light of the corona is made up of a continuum of colours, such as violet, indigo, blue, green, yellow, orange and red. Super-imposed on this continuum are hundreds of dark lines called the *Fraunhofer lines*. Each line indicates some element present in the solar atmosphere. The intensity and width of the lines reveal the temperature and density of the element.

Prominences & Flares. The sun is constantly emitting streams of its substance (mainly hydrogen) as protons (nuclei of hydrogen atoms) in all directions. Sometimes these emissions are massive. They are then seen as *prominences* which send huge bouts of incandescent material upward from the sun's surface. Sometimes these eruptions roll out of the atmosphere of the sun for many miles, when they are seen as solar *flares*. The solar flares are spectacular—hot ionised gas rolling out as enormous clouds, 20 to 40 times the size of the earth at speeds of around 100 km per second through the outer layer of the sun's atmosphere, the Corona. Some of the most spectacular solar flares seen in recent years occurred on Feb. 28, 1942. Nov. 19, 1949 and Dec. 13, 1971.

Solar Wind. A less spectacular but persistent stream of protons is blowing out of the corona and sweeping over the whole solar system. In 1958, the American physicist, Eugene Norman Parker, called this outward stream of protons the *solar wind*. Recent researches through satellites have shown that the solar wind is made up of a plasma**

* See *Natural History* 1/83.

** Plasma is a fourth state matter (in addition to solids, liquids and gases) where the gases are ionised. An *ion* is an atom or group of atoms which has gained or lost one or more electrons and thus carries a negative or positive charge. *Proton*, the nucleus of the hydrogen atom without its electron, is a *hydrogen ion*, *Alpha particle*, the nucleus of the helium atom without its electrons, is *helium ion*.

that is, ionised gas, mostly hydrogen and helium, containing nearly an equal number of protons and electrons. It flows outward from the Sun at supersonic speeds, around 400 km a second. Apparently, this wind sweeps

through the whole solar system to a distance of 40AUs from the Sun which coincides with the very limits of the planetary orbits.

Owing to the sun's rotation, the solar wind travels in spirals and carries with it magnetic fields. The Earth's magnetic field—the magnetosphere—acts as a shield against the ever-blowing solar wind and deflects it away from the earth. Nevertheless, particles of solar wind sometimes pierce the magnetic shield and enter the upper atmosphere, where, like the solar flares, they cause auroral displays.

The solar wind distorts the shape of the magnetosphere. The magnetosphere extends to a distance of 64,000 km above the earth—10 times the radius of the earth. On that part of the earth exposed to the sun (the sunlit side), the solar wind sweeps along the magnetopause past the earth. On the other side of the earth (the night side), the solar wind converges again and compresses the magnetic field into a plume or tail, more or less like what it does to comets. The tail thus formed extends to over six million km on the night side of the earth. The particles of the solar wind and also those from the deep space are trapped in the tail and travel back and forth endlessly.

Sunspots. These are dark patches noticed on the surface of the sun. They appear dark because they are cooler (around 1500°C) than the surface of the sun which has a temperature of about 6000°C. The largest spot ever measured (April, 1974) covered 7000 million sq. miles or approximately 0.7 per cent of the sun's visible surface. The life periods of these spots also vary. They may last from a few hours to many weeks.

They show strong magnetic fields and reach a maximum every 11 years. During the maximum of a sun-spot period, the sun shows marked activity in shorter 'Wave lengths' like X-rays and ultraviolet radiations. Frequent solar eruptions and solar flares occur. These produce great reactions on the earth and its atmosphere such as ionospheric disturbances, magnetic storms, interruptions of

Solar Statistics

‡ Distance from the Earth	149.8 million km.
Absolute Visual Magnitude	4.75
Diameter	1392000 km
Core Temperature	15000000 K
Photosphere Temp	5770 K
Rotation as seen from the Earth	25.38 days (at the Equator) 33 days (near the poles)
Chemical Composition	Hydrogen 71% Helium 26.5% Other Elements 2.5%
Age	About 5 billion years
Expected lifetime of a normal star.	About 10 billion years

‡ The mean distance from the Earth to the Sun (150 million km) translated into flying hours means that a jet aircraft capable of 1000 km/hr. would need more than 17 years of non-stop flying time to reach the Sun.

radio communications, unusual auroral displays and a lowering of the average cosmic ray intensity.

Polar Auroras. There are two auroras, the *Aurora Borealis* or Northern Lights and the *Aurora Australis* or Southern Lights. These are lights that sweep across the sky in waves or streamers or folds. They are very often multi-coloured and provide one of the finest spectacles in nature. They occur in the Arctic and the Antarctic regions. But the Northern Light can be seen as far south as New Orleans in America and the Southern Lights as far north as Australia.

The auroras are chiefly caused by sunspots, which are magnetic storms on the surface of the sun. These storms discharge electrified particles into space. The Earth's magnetic poles attract these particles. Consequently, the north and south poles are the radiating centres of these electromagnetic displays.

The electrified particles from the sun cause gases in the upper atmosphere to vibrate and glow in colours peculiar to them, just as a neon sign glows when electric charges pass through it. The causal relation between sunspots and auroras has been doubted, because the interval between the two was always erratic and never uniform. This has now been explained by the discovery of the magnetosphere.

Magnetosphere. The magnetosphere is the earth's magnetic shield. It was at first called the *Van Allen Belts* after the American physicist, James Van Allen who discovered them in 1959. Van Allen in analysing the data from the earlier Explorer and Pioneer rockets found two belts of high intensity radiation in the upper atmosphere. Pioneer 12 later showed that these belts were a part of a larger band of radiation called the magnetosphere. It extended far out to about 40,000 miles from the earth's surface.

Here the protons and electrons that shot out from the sun are caught and held by the magnetism of the earth. The upper belt with its centre, some 1500 miles from the earth, does not touch the atmosphere. The lower layer several hundred miles high is much larger and touches the atmosphere in the vicinity of the poles.

15. INNER PLANETS★

Mercury is the planet closest to the Sun and the smallest. It was believed that the period of Mercury's rotation on its own axis corresponded with its period of revolution, like that of the Moon. Recent radar readings, however, have shown that Mercury rotates on its own axis in 58.65 days while it takes 88 days to complete one revolution round the Sun.

This means that Mercury spins three times (3×58.65 days) for every two revolutions (2×88 days) round the Sun. The result is that when Mercury is in a most favourable view-

ing position, we see nearly the same face with the same markings. This is how the mistaken notion arose that its period of

• For data regarding planets, see S. 12 *supra*.

rotation was the same as its period of revolution.

According to Gérard Kupier, Mercury was probably twice as massive originally but the Sun evaporated away half its substances. The lighter, more volatile elements escaped, leaving a heavy planet, that is probably about 30 per cent silicates or rock and 70 per cent metals. It is $5\frac{1}{4}$ times as dense as water. Even today Mercury bathes constantly in the ferocious heat of the Sun. When it is closest to the Sun, temperatures reach 650°F on the equator though they probably drop during the long night to minus 300°F .

Astronomers have never seen Mercury really well, even though it is reasonably close to the Earth. The planet stays so close to the Sun in its tiny orbit, that to the naked eye, it is almost always lost in the Sun's glare. From the Earth, it can sometimes be seen for a short time as an *evening star* just after sunset or as a *morning star* just before dawn. But the Earth's thick haze-and-dust-filled atmosphere on the horizon often blots it out.

It is doubtful if Mercury has an atmosphere. With low gravity (one-third of the Earth's) and high temperatures, atoms and molecules of almost all gases must have escaped into the interplanetary space leaving Mercury devoid of atmospheric gases.

Venus. Venus, the planet closest to the Earth, is also the brightest object in the sky, barring, of course, the Sun and the Moon. Named after the Roman goddess of beauty, Venus is popularly known as a star – as the *Evening Star* and the *Morning Star*. It is slightly smaller than the Earth, being some 300 miles less in diameter. Venus, unlike most other planets, rotates backward. Because of the combination of the slow backward motion and the 225 days it takes the planet to make one orbit round the Sun, Venus sees the Sun rising in the west every 117 days.

Many of the popular notions regarding Venus have been radically altered by the space probes of Venera 4 (Oct. 1967), Venera 5 and 6 (May 1969), Mariner 2 (Dec. 1962) and Mariner 5 (Oct. 1967).† These probes have proved that Venus is a very hot

planet – possibly the hottest of planets. Its temperature at the equator may go as high as 1000°F . At such a temperature, lead, tin and zinc will melt and a number of compounds will vaporise. But at the top layers of Venusian clouds temperatures drop to minus 35°F . Here, we have a most interesting phenomenon – a red hot planet wrapped in clouds of ice, with freezing temperatures above and boiling temperatures below.

A curious feature of Venus discovered by the Russian Venera series 7 and 8 is that both the night and day temperatures are nearly the same. This means that heat is being transported from the day side to the night side. Strong winds in the higher atmosphere seem to be the carriers of heat.

While the highest clouds on the Earth seldom go above 10 miles, Venus has a thick layer of clouds, about 35 miles high. They block much of the sunlight. The result, according to some scientists, may be a murky twilight on the surface of Venus, more or less like living at the bottom of a dust storm or dense smog. The thick atmosphere does more than block the sunlight. It traps the Sun's energy and builds up a furnace-like heat. This is the wellknown 'green house effect'. Solar energy filtering through the clouds is absorbed by the surface and is re-radiated as longer wave length infrared rays. But the cloudy atmosphere of Venus acts like the glass roof of a green house; it blocks the infrared re-radiation from escaping into space. This is supposed to be one of the reasons why Venus has turned out to be a very hot planet.

Venus Craters: The surface of Venus appears to be pock-marked with craters, like that of the Moon or Mars. This was brought out in an analysis made by the Jet Propulsion Laboratory (US). An area, some 900 miles wide near the Equator of Venus, is marked with a dozen or more craters. These are very large craters, with diameters ranging from 21 to 100 miles. There might be smaller craters, but they are not visible. The area is basically flat, no more than 3300 ft. in altitude. All the craters are shallow, compared to their area.

† Later probes by US and USSR have materially added to our knowledge of the planet. The latest probes were in Dec 1978–Pv (Pioneer Venus) 1 & 2, US, and Venera 11 & 12, USSR.

The 100-mile crater is only a quarter of a mile deep.

The atmosphere of Venus is also unique, consisting as it does almost entirely of carbon dioxide (90-95 per cent). It has a pressure of a hundred terrestrial atmosphere (100 times the pressure of the Earth's atmosphere). This is equal to the pressure of water more than half a mile under the sea.

Venus has no satellites like Jupiter, no rings like Saturn and no ice caps like Mars. It has a very weak magnetic field, 3/10,000 of the Earth's magnetic field and has no radiation belt like Van Allen Belt.

The Earth

(See the Earth)

Mars, named after the Roman god of war, is the fourth planet from the Sun. When Mars is favourably situated it is brighter than most of the stars and is definitely red, which has earned for it the surname Red Planet. Mars has polar caps similar to those of the Earth and because the Martian axis is tilted at almost the same angle as the Earth's, its polar regions are exposed to sunlight in alternation, giving each hemisphere summer and winter.

The relative orbits of Mars and the Earth bring them very close - a little more than 35 million miles - *on two occasions about 2 years apart and then remove them far apart for another 15 years. In September 1956, Mars paid the second of the current series of close visits to the Earth and the third in 1971.

The pictures that Mariner 9 has sent down show that Mars is internally alive and more like the Earth than the Moon, with volcanoes, greater than any on the Earth, canyons and dusty basins, jumbled uplifts and fractures.

Mightiest of the Martian mountains is *Nix Olympica* (the snow of Olympus), a volcanic mountain that embraces a vast caldera or crater 40 miles across. It is the highest point on Mars, standing some 15 miles above the plain, nearly three times as high as Mount Everest.

Huge Rift. Mars is marred by a huge rift which cleaves the planet's equatorial zone for 2300 miles. It is 20,000 feet deep and 75-150 miles wide. This huge rift proves that the planet's interior is geologically alive.

Mars is a dusty planet, with the dust often in motion, driven helter-skelter by dust storms, which sometimes envelop the major portion of the planet in a dusty haze.

Mars must at one time have had meandering rivers like those on the Earth, if the dry 'river beds' are any indication. †Schiaparelli does not appear to have been just fanciful when he spoke of canals, for the sinuous channels seen on Mars are in all likelihood, "the beds of ancient rivers through which large amounts of water, once flowed". *But today liquid water does not exist on the surface of Mars.

The Viking mission to Mars in 1976 was intended to find out if there were any signs of life on Mars. Viking I landed on Mars on July 20, 1976 and Viking II on Sept. 3, 1976. The experiments conducted by them have shown that there is no sort of life on Mars.

Mars has two small satellites, which have been named *Phobos* (Fear) and *Deimos* (Terror), after the legendary attendants of the war god, Mars. The Mariner 9 pictures of Phobos show it to be 20.8 km wide by 24.8 km long. Of the 34 moons in the solar system, Phobos is the only one moving around its parent planet faster than the planet itself. It completes three trips-11 hours each-every Martian day (24 hour 40 minutes). Deimos, with a diameter of only 8 km requires only a few hours more to revolve around Mars than what Mars takes to rotate on its own axis. As opposed to Phobos, Deimos is a slow moon. Phobos would pass between Mars and the Sun about 1400 times each year, while Deimos passes only 130 times. As seen from Mars, Phobos would appear to rise in the west and set in the east while Deimos does just the opposite.

† Schiaparelli, an Italian astronomer, announced in 1877 that he had seen canals on the surface of Mars and suggested that Mars might be inhabited by intelligent beings.

* Bradford A. Smith, Director of Planetary Research, New Mexico University.

16. OUTER PLANETS

Jupiter is the giant among the planets. Its mass is 71 per cent of the total mass of the planets. It has one and a half times the volume of all the other planets combined. But its mean density is only one-fourth of the Earth's—a low value characteristic of all the Jovian planets.

Jupiter appears to have stopped halfway to becoming a star. It was too massive to solidify as a planet but not massive enough to develop 'nuclear fusion' and become a star. It has thus come to possess both stellar and planetary characteristics. Jupiter's star-like features are two. It gives off more energy than it receives from the Sun – two or three times as much. All planets draw from the Sun whatever energy they possess. Jupiter emits random bursts of intense radio energy at long wave lengths. It is the most powerful radio object in the solar system, next to the Sun. No other planet is known to possess radio energy of its own. In all other respects Jupiter resembles the other planets.

Jupiter Mass. Much of Jupiter's mass is made up of atmosphere which is estimated to be some 25,000 miles deep. The atmosphere consists largely of hydrogen and helium which explain the low density of the planet—1.34, roughly one-fourth of the Earth's density. Methane and ammonia which are formed when hydrogen joins with carbon and nitrogen respectively are also present in the atmosphere. It is thought that Jupiter has the primordial atmosphere of the Earth—hydrogen, methane, ammonia and water—from which life originated on Earth. It is quite possible that a similar process of life will have been started on Jupiter.

The atmosphere of Jupiter is marked by a series of stripes which go round the planet. Astronomers have counted 5 bright stripes and 4 dark gray stripes. The bright stripes appear to be rising columns of air while the dark stripes represent descending columns. The atmosphere changes from gas to liquid at a depth of 1000 km. This is Jupiter's surface, made up entirely of liquid hydrogen, without any detectable solid area.

Jupiter is hot inside. At the core, temperature may go up to 25000°C which is more than four times the surface temperature of the Sun (6000°C).

The Core. What is at the core of Jupiter is not known. It is thought that it is made up of solid hydrogen. When pressure rises above a million Earth atmospheres, hydrogen atoms are crushed in such a way that their electrons are separated from their nuclei. In this state hydrogen behaves like a metal. It is denser than normal solid hydrogen and like most metals is a good conductor of electricity. Jupiter's core is supposed to be made up of this extraordinary stuff – a metallic version of an element known on Earth as the lightest of all gases.

The most conspicuous thing about Jupiter is its *Great Red Spot*. It was first noticed by Cassini in 1665 and observed continuously since 1872. It is an extensive area, about 40,000 km long and 10,000 km wide. The investigations of Pioneer 10 and 11 seem to indicate that this Great Red Spot represents a huge storm—a super-hurricane, existing for hundreds of years, without abating. This storm is probably powered by Jupiter's internal heat.

Jupiter has 16 satellites. The biggest four satellites, Io, Europa, Ganymede and Callisto, were discovered in 1610 by Galileo. They are now collectively called Galilean satellites. The 14th planet discovered in 1979 is the smallest of the satellites. It has tentatively been named 1971 J1. It is only a few dozen km in diameter and is about half-way between the surface of Jupiter and the orbit of Amalthea. Amalthea and the four Galilean satellites travel in circular orbits around Jupiter. The remaining satellites are much smaller and travel in irregular orbits.

The four outermost satellites, curiously enough, revolve round Jupiter from east to west, contrary to the motions of the great majority of satellites in the solar system and to the revolution of the planets around the Sun. One explanation of the retrograde motion of these satellites is that they were originally asteroids moving about between the orbits of Mars and Jupiter and that Jupiter's gravitational pull had drawn them up. This is quite possible when we consider Jupiter's gigantic mass.

Saturn. Saturn is the outermost planet visible to the naked eye. With a rocky core of the size of the Earth, Saturn is the second largest planet (next to Jupiter) but the least dense. It has a density of only 0.69 less than that of water.

Compared to its neighbour Jupiter, Saturn looks unexciting. The two planets are considered very similar—giant balls of hydrogen and helium with hot interiors that provide much of the heat that drives their winds and determines their weather. However, Voyager I has shown that Saturn does have a minor version of Jupiter's Great Red Spot. It has also white ovals and bands of lighter and darker clouds like Jupiter's. Both planets have strong Jet Streams racing round their Equators (see *Atmosphere* infra) Saturn's Equatorial jet is, however, three times broader than Jupiter's. Its winds are three times stronger too—a thousand miles an hour. The difference in the width and speed of Equatorial Jets, as between Jupiter and Saturn, is accounted for by the difference in the internal heat generated by the two planets. Jupiter generates the same amount of internal heat as it receives from the Sun. Saturn being farther off receives only $\frac{1}{4}$ of the solar heat received by Jupiter. Saturn compensates for this by releasing a much greater quantity of internal heat. It is this greater internal heat of Saturn that powers its stronger winds.

Rings. The most spectacular feature of Saturn is its system of rings. This has mystified all astronomers from Galileo downwards. The discoveries of Voyager I have only deepened the mystery. Says Bradford Smith, the leader of the team that scans Voyager images, "The mystery of the rings keeps getting deeper and deeper until we

think it is a bottomless pit." The Voyager has upset practically all notions of Saturn previously accepted as correct. The Cassini Division, for example, noted by the Italian astronomer Cassini in 1676, has been regarded all these as a clear zone between the rings. Voyager has shown that far from being clear the Division is crowded with ringlets. It is now found that trillions of particles ranging from minute pinheads to chunks as big as our biggest buildings populate Saturn's ring system. This is all that can be safely said about them. All the rest is a medley of guesses, doubts and questions.

The rings are today identified by letters A to G. These letters themselves are confounding because the rings are not arranged in any alphabetical order. Thus D ring is closest to Saturn with C coming next. B third and A fourth. Then comes the F ring, followed by G. Last and outermost is the E ring.

The rings display remarkably different characteristics. It is thought that these rings have been formed at different times and shaped by different forces and probably new ones are being still formed. The F ring is unique. It looks as if it has been braided, 'kinked, clumped, split and tied up in knots' as one astronomer put it.

Moons & Moonlets. Saturn has the biggest family of satellites—a total of 17. Of these 10 were known by 1976. The others were identified by earth-based telescopes and Voyagers I & II from 1979 to 1981 (see S.17 *Satellites* infra)

The newly discovered moons are rather small and irregular in shape. Apparently they have been formed by the fragmentation of larger bodies. 1980 S 28 is the innermost moon of Saturn and lies at the outer edge of A ring. 1980 S 27 and S 28, called the shepherd moons, lie on either side of the F ring. 1980 S 1 and S 3 are co-orbital moons and come between the F and G rings. 1980 S 13 leads Tethys by about 60 degrees while 1980 S 25 trails Tethys by 60 degrees and 1980 S 6 leads Dione by 60 degrees. These three are called Lagrangian moons since they occupy a position of stability predicted by the French astronomer Lagrange in the 18th century. These are the first known Lagrangian moons.

The Shepherd moons are so called because their main function appears to be to

herd together the straying particles of rings, just as a shepherd herds his sheep. These moons, big chunks of ice, hold in place millions and millions of rings particles spanning 63,000 km.

The co-orbital moons, so called because they move in the same orbit, form another interesting pair. Their orbital velocities differ with the result that the inner moon slowly overtakes the outer moon. As they approach each other, the inner moon gains momentum and moves into the outer orbit where its speed is reduced. The outer moon at the same time loses momentum and moves into the inner orbit where it gains speed. In short, the two moons change places, the inner moon becoming the outer moon and lagging behind. About once every four years this celestial dance is repeated and the two change places again.

Titan, Saturn's biggest satellite, is known to have an atmosphere. But since Titan is covered up by dense clouds, it is not possible to see what its surface looks like. Titan's atmospheric pressure is 1.6 times that of the Earth. Titan's diameter is also found to be only 5140 km, much lower than the previous estimates.

Uranus. Uranus is not visible to the unaided eye, but may be seen through good field glasses. It has five satellites, *Ariel*, *Umbriel*, *Titania*, *Oberon* and *Miranda*. All of them are comparatively small.

In 1977 astronomers aboard the Kuiper Airborne Observatory found that Uranus is surrounded by a system of five very faint narrow rings. These rings named Alpha, Beta, Gamma, Delta and Epsilon were at distances of 27860, 28460, 29670 and 30090 miles respectively from the centre of Uranus. The four inner lines—Alpha, Beta, Gamma and Delta—are each about 8 miles wide while Epsilon is many times broader.

All rings are well inside 40,000 miles from Uranus, which is the Roche's limit for Uranus, that is, the limit within which a large satellite would be torn apart by tidal forces.

Uranus was identified as a planet in 1781 by William Herschel and has completed only two revolutions round the Sun since its discovery. This chill methane planet is $14\frac{1}{2}$ times as massive as the Earth and has a temperature of about 170°C . It takes some 84 terrestrial years to circle round the Sun and

its day is 10 hours 49 minutes. The equator of Uranus is tilted at 98° of the plane of its orbit with the result that it practically rolls on its sides as it revolves round the sun and exposes its polar regions (north and south) to whatever light and warmth the Sun gives in periods of 42 years each.

Neptune. Neptune, between 2900 and 2700 million miles from the Earth, is also visible through good field glasses.

The planet was discovered in 1846, as a result of calculations made independently by two astronomers, Adams in England and Le Verrier in France. These calculations gave the position of an unknown planet which was responsible for the perturbations in the motion of Uranus. The planet was found on 23rd Sept. 1846 in the indicated neighbourhood by Gottfried Galle of the Berlin Observatory. It appears to be a pale green orb, no brighter than an 8th magnitude star.

Neptune has four satellites. Of these *Triton* goes round in a retrograde orbit.

Pluto. Pluto the outermost planet and removed from the earth by a distance between 4700 and 2700 million miles is visible only through a telescope. This planet was finally located in February 1930 after a long arduous search by C.W. Tombaugh at the Lowell Observatory, Arizona, (USA).

Pluto is a tiny sphere, a little larger than Mercury and revolves eccentrically between 4600 and 2700 million miles from the Sun. It has no satellites. Its orbit is interlaced with that of Neptune. This has led some astronomers to believe that it is "a run-away" satellite of Neptune. An existing Neptunian satellite, Triton, also appears to have escaped Neptune's hold in the first instance, but had been brought back. This is supposed to be the reason why Triton goes about in a retrograde orbit, opposed to that of Neptune.

Pluto appears to have been lost permanently. The latest theory is that Triton, with a diameter of 6000 km and Pluto 5800-6000 km in a diameter were two gigantic satellites of Neptune that revolved in the normal manner of satellites. Then owing to some "interaction" between the two—probably they started shoving each other—Triton was pushed into a retrograde orbit and Pluto was pushed out of the satellite orbit. Pluto was thus 'kicked upstairs' to the cadre of a planet.

Satellites. The satellites or moons revolve round their mother planets or primaries. The solar system is known to have at least 45 satellites. Of these Jupiter claims 16, Saturn 17, Uranus 5, Neptune 4, Mars 2 and Earth 1, Mercury, Venus and Pluto have no satellites.

Of Saturn's 17 moons, 10 had already been discovered by 1976. Three were discovered by Earth-based telescopes in 1970-80. The rest were discovered by Voyager 1 and 2. The new moons have not been named. They are presently known by numbers as follows.

1980-S1, SS3, S6, S13, S25, S26, S27 and S28.

Among satellites our Moon is distinguished in two ways. First, it is an only satellite. All planets other than the Earth either have no satellites or have more than one satellite. Second, the Moon is proportionately the biggest in size compared to the mother planet. Triton, the biggest of the satellites (?), is less than one-eighth of its mother planet, Neptune. Our Moon is one fourth of the size of the Earth. All other satellites are quite insignificant in size compared with their mother planets.

Neptune: An Indian's Theory

The Canada-France-Hawaii Telescope Corporation is the fourth scientific team to corroborate the theoretical discovery by noted Indian Scientist J.J. Rawal of undetected satellites of the planet Neptune.

Two telescopes of the corporation in Hawaii had found in August, 1985 evidence of some kind of satellites in the orbit around Neptune. According to the operators of one of the telescopes, small objects were seen in the orbit around the planet.

Dr. Rawal of the Nehru Planetarium at Worli in Central Bombay, had recorded four satellites, each 35,520 km, 57,710 km., 96,310 km and 71,300 km away from the centre of Neptune. These findings had been recorded in a research paper entitled, "Resonant structures in the solar system", published in 1981 in the international astronomy research journals- The Moon and the Planets and Sky and Telescope.

Earlier, one of the two teams of astronomers at Arizona University in the US, led by Dr. Harold Reitsema had concluded that occultation where Neptune slid past a star was caused by a hitherto undetected satellite at least 180 km across and about 50,000 km from the centre of the planet, too faint and too close to it for direct detection.

Dr. Brian G. Marsden of the Smithsonian Astrophysical Observatory reported that apart from Dr. Reitsema's team another group of astronomers at Arizona University had observed the occultation involving Neptune which confirmed Dr. Rawal's findings.

The second satellite predicted by Dr. Rawal had been identified by astronomers T. J. Jones and P. Nikholson working at the Mount Stromio Observatory in Australia. They witnessed the object travelling in the orbit about 37,000 km from the planet's centre.

According to Dr. Rawal's theory, as reported in The Moon and the Planets, these two satellites could be part of the "ring system" around Neptune.

The distance of each of the satellites of Neptune as given by the American and Australian teams was more or less the same as predicted by Dr. Rawal more than a year ago.

Prediction of new rings and more satellites around the giant planets, Jupiter and Saturn, made by Dr. Rawal as early as 1978, were also confirmed by photographic observations by American Voyager and Pioneer spacecrafts which passed the planets in 1980, UNI reports from Bombay.

17. The Moon

The Moon is the only satellite of the Earth. But it is a satellite of distinction. For, it is the only satellite in the solar system far too big to be a satellite. All other satellites have sizes ranging below $\frac{1}{8}$ of the sizes of mother planets. But the moon is about $\frac{1}{4}$ of the size of its mother planet, the Earth.

The incompatibility of the relative sizes of the Earth and the Moon, and their separate existence at such close quarters led to the conjecture that the Moon is not a true satellite but was captured by the Earth during a close approach to the Earth. This theory known as the *Spouse Theory* states that the Moon came from elsewhere in the solar system and sweeping too near, it was snared by the Earth's gravity and "married"- that is, locked into orbit. The second theory known as the *Daughter Theory* says that the Earth once rotated so rapidly that it became blimp-shaped and was torn into two, the smaller blob, entering into orbit as the Moon. The third theory-the *Sister Theory* -suggests that the Earth and the Moon were formed more or less at the same time from the original wheeling cloud of cosmic gas that ultimately condensed into the planets and the satellites.

The Moon has a diameter of 2159 miles as against the Earth's 7900 miles. But it has a surface less than half that of the Atlantic Ocean. Therefore its gravitational pull is about one-sixth of the Earth's. Because the orbit of the Moon about the Earth is not circular but elliptical, the maximum distance (apogee) which the Moon may keep from the Earth is 252710 miles and the minimum distance (perigee) 221463 miles. The Moon revolves round the Earth in $27\frac{1}{3}$ days (27 days 7 hours 43 minutes and 11.47 seconds) and rotates on its own axis in exactly the same time. This is why we see only one side of the Moon.

Topography. To our unaided vision the near side (front side) of the Moon seems to be made up of bright and dark patches. The bright parts are the mountains and highlands that catch the Sun's rays, while the darker patches are low-lying plains. These

were once thought to be seas (marias) and named accordingly, though the Moon is devoid of water. The craters are depressions caused by the onslaught of meteors. They vary in size. As if to make up for lack of oceans such as we have on Earth, the Moon has raised high sharp-peaked mountains, many of them rising to 20,000 ft. The highest of these are Liebnitz Mountains, near the Moon's south pole, which rise to 35,000 ft. higher than Mount Everest.

The Moon has no atmosphere, as its gravitational power is too weak to hold down gases. This causes many strange phenomena. There is no twilight, the day dawning suddenly, as there is no atmosphere to be lit up before the Sun comes over the horizon. There is no sound either, as sound is a vibration transmitted through air.

Temperature on the Moon reaches extremes. During daytime the temperature rises to 100°C , at night it comes down to minus 180°C .

The Moon along with the Sun is responsible for the tides. The Moon, being nearer to the Earth than the Sun, exerts a greater influence on the tides. It takes only 1.3 seconds for moonlight to reach the Earth, whereas sunlight takes as much as 8 minutes 16.6 seconds to reach us. This being so, the ratio of lunar and solar power for tide-raising is 11 to 5 (Also see *Hydrosphere*).

Man on Moon. Apollo XI which landed two men on the Moon in July 1969 has blazed a new trail in man's exploration of space. It has enabled man to step on to the surface of the Moon—a possibility that the wildest legends of early times had discounted. USA has followed up this initial success by Apollo XII, Apollo XIV, XV, XVI and XVII

Meanwhile, USSR set up the unmanned Luna 16 (Sept. 12, 1970) and Luna 17 (Nov. 19, 1970). Luna 16 picked up Moon soil samples and returned to the Earth on September 24, 1970. Luna 17 carried the Moon buggy Lunokhod 1, which roved the surface of the Moon. It was an eight-wheeled vehicle, which carried apparatus to study the lunar surface and radioed back the results to the Earth.

All these manned landings on the Moon and the investigations of the unmanned spacecraft like the Lunas, haven't solved the lunar puzzles. The question of the origin of the Moon and whether it is a daughter, sister or spouse of the Earth still remains unsettled.

However, the oldest rocks and soil samples brought back by the Apollo astronauts have shown that the Moon is about the same age as the Earth and was formed about 4600 million years ago.

Apollo Discoveries. Among the 6 Apollo missions that actually landed on the Moon, the first two were confined to the maria or low-lying portions and the others to highlands and areas of varied terrain like rills (narrow valleys). The Apollo missions have brought back nearly 800 pounds of lunar rocks which are being analysed and studied.

The most striking aspect of the Moon's appearance is the abundance of craters on its surface. They range in size from circular basins 1000 kilometres (about 620 miles) in diameter down to craters measuring less than a few metres or feet across. The majority of these craters have been produced by a continuous rain of meteorites over the eons.

The earth has also been subjected to meteoric bombardment, but the erosive action of winds and water, volcanic activities and earthquakes have obliterated evidences of meteoric impact on the Earth. Because these forces are absent on the Moon's surface, the lunar surface has preserved a record dating back to the time of the Moon's formation.

Moon Rocks. The first landing sites (Apollo 11 and 12) were *mare* areas. The rocks from this area turned out to be basaltic lava, similar to volcanic rocks found on Earth.

A surprising finding was the occurrence of a high percentage of titanium. While terrest-

Moon's Size and Motions

Mean distance from Earth	238,855 miles
Diameter	2159.9 miles
Diameter in terms of Earth's diameter	0.27250
Mass in terms of that of earth	1:81.30
Density in terms of water	3.34
Density in terms of Earth	0.6058
Ratio of gravity to gravity at the Earth's surface	0.166
Fraction of Moon's surface always invisible	0.410

rial igneous rocks contained only about 1 per cent of titanium, the lunar rocks showed 10 times as much. A few minerals unknown on earth were found in the mare basalts. Among these is *Armcololite*, a new name derived from the names of the astronauts—*Armstrong*, *Aldrin* and *Collins* and the name of the area *Tranquillitatis*.

The lunar rocks were bone-dry, with no trace of water in any form. Neither did they contain any trace of any organic matter. So also, volatile elements (elements with low boiling points) like Sodium, Potassium, Chlorine, Germanium, Lead and Mercury were practically non-existent. The depletion of Sodium and Potassium is significant, because these two are among the most abundant elements found in terrestrial rocks.

The oldest rock recovered from the Moon was found at *Descartes* highland where Apollo 16 landed. It is 4.25 billion years old. On our present evidence this may be taken as the earliest date on which the surface of the Moon solidified.

Moonquakes as recorded by seismometers left by the Apollo Missions, run into hundreds. Some are the results of meteor impacts, others are landslides of the inner slopes of craters. But many are true lunar quakes. The magnitudes of these quakes, however, go up only to 2 on the Richter scale with 1.5 the smallest tremor that can be felt.

One peculiarity of these moonquakes is that they occur most often when the Moon approaches closest to the Earth. This means that the Earth's gravity exerts a forceful tidal pull on the Moon that causes the rocks in its interior to slip against each other and produce jarring vibrations.

The evidence so far gathered shows that the moon was hot and geologically active during the first 1.5 billion years of its existence. It is not known whether the entire Moon was then molten, but at least a layer 200 to 300 kilometres thick near the surface must have melted in order to produce the rocks found there. Gradually the surface layer cooled, but at the same time the

interior warmed up because of heat released by radio-active decay. Rocks in the interior melted and were extruded on to the surface in a series of lava flows. This melting effect lasted until about 3.1 billion years ago. Then the Moon's interior cooled, and except at very great depths it has remained rather cold and geologically inert ever since.

(See chapter on Space Exploration)

18. Comets

The word Comet is derived from the Greek *aster kometes* meaning long-haired star. The long hair is the tail which looks like hair blowing in the wind. The head or the *coma* is the star.

Comets have been associated with disasters from the earliest times. It is not known how comets—alone of all astral bodies—came to be treated as evil portents.

Origin. Most astronomers have now come to believe that comets are primordial remnants from the formation of the solar system. They have their home in the cold outer fringe of the solar system away from the outermost planet. In this cold dark domain, where the Sun looks no brighter than a distant star, millions of cometary nuclei are congregated. Most of them are a mile or so in diameter though some may reach diameters of 50 miles or more.

Here, the comets are non-luminous and have no tails and move slowly in enormous orbits around the far distant Sun. But now and then, gravitational changes (e.g. the gravitation of the stars they pass by) shake out some comets from their slow orbits. Some of these move out into the interstellar space and are lost to the solar system. Others move into the solar system eventually to become the brilliant long-tailed comets that we see from the Earth.

Structurally, a comet consists of three parts, a nucleus, a head and a tail. The *nucleus* is a tiny object, only a few kilometres, in dimension. It is made up of ices of various compounds like ammonia, water, dust and larger particles. It reflects sunlight and appears as a bright spot in the centre of the head. The *head* is comparatively big extending up to a million kilometres. It is made up of gas and microscopic dust particles. The *tail*,

which is the distinguishing feature of the comet, is much larger than the head, extending to a length of 20 to 30 million kilometres.

The comet does not possess its typical head and tail when it is far away from the Sun. The head appears when it comes near Jupiter's orbit, and the tail develops when it crosses the orbit of Mars. The evaporation of the solid ice material around the nucleus, when the comet approaches the Sun, is responsible for the appearance of the head. At the same time, solar wind is driving away the gaseous matter attached to the head. This explains the streaming tail.

Orbits. A comet may have three kinds of orbits. If the comet approaching the Sun does not have enough speed to overcome the Sun's gravity, it will settle down in an *elliptical* orbit like our Earth. A comet which has just enough speed to counter-balance the Sun's gravity will take on a *parabolic* orbit. If a comet is fast enough to overcome the Sun's attraction, it will describe a *hyperbolic* orbit and escape into interstellar space.

Comets that keep re-appearing in the solar system are said to be *periodic* comets. As they come near the Sun, they whip around it at enormous speeds and shoot away from the Sun, with their tails pointing ahead.

The periodic comets are divided into two categories, the short period group and the long period group. The short period group has periods of less than 200 years each. The long period groups have periods going up to thousands of years.



Halley's Comet, named after the English astronomer Edmund Halley, reappears every 76.3 years. The Great Comet of 1811 comes back once in 3000 years, the comet of 1844 in something more than 100,000 years while the comet of 1864 takes as much as 2,800,000 years to return.

It is estimated that the solar system may contain as many as 100,000 comets. But most of these stay at home, so to speak. Only very few comets stir out into interplanetary space and move around the Sun. Till 1974, according to an official catalogue, 611 comets were reported starting with Halley's Comet in 87 B.C. Out of these, 513 are long period comets which do not return for 200 years or more. The remaining 98 are short period-less than 200 years between visits. Sixty-five of these have been sighted more than once since they were noticed first. The most frequent visitor is Encke, first seen in 1786. Its period is so short (3.3 years) that it has returned 65 times since then.

New comets appear on the horizon now and then. On an average about half a dozen new comets are discovered every year. In certain years the number goes up to more than a dozen. Thirteen comets were spotted in 1932 and 1947.

Comets are named after their discoverers. Thus the comet which appeared on Feb. 27, 1975 has been named *West-Kohoutek Ike-mura 1975 B*, apparently because three persons noticed the comet more or less simultaneously. The comet which appeared on March 7, 1975 has been named *Kohoutek 1975 C*, after Dr. Lubos Kohoutek of the Hamburg Observatory (West Germany). The letters B and C indicate that they were the second and third comets which appeared in 1975. *Kohoutek C* is not expected to return for another 75,000 years.

Some Famous Comets

Year and No.	Name of Comet	Period Years
1744	De Cheseaux's Comet	-
1806	Biela's Comet	6.7
1811	I Great Comet of 1811	300
1812	- Di Vico's Comet	70.7
1815	Olber's Comet	74.0
1819	I Encke's Comet	3.3
1819	Pons-Winnecke Comet	6.0
1835	III Halley's Comet	76.3
1843	I Great Comet of 1843	512.4
1844	II Great Comet of 1844	102.050
1858	VI Donati's Comet	2040(?)
1864	II Great Comet of 1864	2,800,000
1871	III Tuttle's Comet	13.8
1874	III Coggia's Comet	6000(?)
1879	Brorsens Comet	5.6
1881	II Tebbutt's Comet	-
1889	VI Swift's 2nd Comet	7.0
1892	III Holme's Comet	6.9
1911	IV Halley's Comet	76.3
1923	d'Arrest's Comet	6.6
1925	II Comet Schwassmann-Wachmann	16.2
1975	Comet West	1,000,000*

* Comet West discovered by Dr. Richard West of the European Southern Observatory in Chile in 1975, sported a gigantic tail 1 million km long.

Every time a comet passes near the Sun, it loses some matter which clusters together in space. The gas and dust escape first, leaving the solid core of the head. Sometimes the core itself disintegrates leaving a stream of small particles that gradually spread out in space. Every year the Earth passes through several clusters of these cometary fragments or cometary materials, whose broken pieces shine briefly as shooting stars in the night sky (see *Meteors*). Sometimes the head escapes disintegration. It will then resemble a small asteroid. Some astronomers think that many of the asteroids are made up of such dead comets.

Halley's Blue Moon

Halley's, the Comet of the century has been coming close to the Earth and inner Solar system from time immemorial, almost regularly once in about 76 years. The earliest records date back to 467 B.C. proving that the astronomers have known this comet at least for the last 2500 years.

Since its last appearance in 1910, it once again approached the inner solar system in 1985. It became visible through small telescopes and binoculars throughout the rest of the year and is expected to remain so till the end of April, 1986. Its next date with the Earth will be in 2061.

The Comet is named after Edmund Halley, the English Royal Astronomer, who in 1705 had predicted that the celestial wanderer would reappear in 1758. Halley died in 1742 and the comet was sighted on Christmas day in 1758. Halley's bold prediction was then hailed with acclaim and it was thus named after him.

A number of space probes are in operation to study the comet. One of them is Giotto launched by the European Space Agency, a consortium of 12 European nations. Giotto is expected to reach within 500 km of the comet's nucleus. USSR's Inter-Cosmos Space Agency launched the Vega series of crafts to reach the comet within 10,000 kilometres of the nucleus. Japanese probe Sakagake is scheduled to pass within 200,000 km of the comet to record its structure. NASA's International Cometary Explorer (ICE) is another notable probe. ICE will pass within 90 km of the surface of our Moon en route to Halley's Comet.

These scientific probes will clarify many theories about comets. According to scientists, the icy particles and dust in the comet's gaseous core come from the giant clouds of matter that once gave birth to the Earth and planets in our Solar System.

Meanwhile, NASA's ICE, in its first mission, sliced through the tail of comet, Glacobini-Zinner, some 70 million kilometres from the Earth in September 1985 and sent a stream of valuable data home. This has been hailed as the first encounter of a man-made object with the most mysterious body in the Solar System.

19 ASTEROIDS

The Asteroids, also called planetoids, are swarms of tiny planets, revolving round the Sun, mostly between the orbits of Jupiter and Mars. This region is called the asteroidal belt and extends from 2.2 to 3.6 AU (Astronomical Units).

The total number of asteroids is estimated to be between 40,000 and 50,000. They are really nothing more than masses of rock revolving round the Sun.

In 1801 an Italian, Giuseppe Piazzi, discovered a star-like body beyond the orbit of Mars where a 'missing planet' was supposed

to be located. Named *Ceres*, it proved to be the first and largest of the asteroids. Ceres, an airless lifeless ball 955 km in diameter, is large enough to be called a planet. A few others later discovered—*Pallas*, *Vesta*, *Juno*, *Hebe* and *Iris*—are fairly big. But the great majority are irregular chunks, around a mile

Colliding Asteroids

Although no asteroid is known to have collided with the Earth in historical times, such collisions are thought to have occurred in the pre-historic past. Luis Alvarez, 1968 Nobel prize winner for physics, holds that a 10-kilometre asteroid struck the Earth 65 million years ago, wiping out 70% of the plant and animal life. The dinosaurs disappeared in this catastrophe. When the asteroid crashed, the material from the explosion covered the Earth and took about 3 years to disperse.

Two facts support this view. 1. According to Ian Halliday, a Canadian astronomer, there are about 13,000 Apollo asteroids, moving in orbits fairly close to the Earth. Of these only 30 have been identified so far. 2 Paleontologist Dale Russell (Canada) says that studies of about 5000 dinosaur skeletons showed no evidence that they became extinct in the natural course of evolution. Some sudden catastrophe must have wiped them out. Alvarez claims that he and his co-workers at Berkeley, California, have "demonstrated conclusively that a body coming from the solar system caused the catastrophe."

or so in diameter.

The first ten asteroids discovered in the first half of the 19th century are also the biggest. New asteroids are being discovered every day. The new asteroids are given permanent numbers and usually also named by a central authority, now at the Cincinnati Observatory, USA. As on 1st Jan. 1973, 1813 objects have been counted in the asteroidal belt and their numbers assigned* (*Science Today*).

The main asteroidal belt, a collection of thousands of rocky bodies, lies between Mars and Jupiter. The majority of these are closer to Mars than to Jupiter. Ceres and all the other big asteroids are found here.

Apollos & Trojans. The asteroids form two groups *Apollos* and *Trojans*. The Apollos form a small group of 19 small asteroids, one of which named Apollo has lent its name to the whole group. They range in diameter from 200 metres to as much as 6 km. Most of the Apollos cross the orbit of the Earth in their circuits round the Sun.

Trojans are another group of asteroids that travel in Jupiter's orbit in step with Jupiter and in such a way that Jupiter, the Sun and the asteroids form an equilateral triangle. Such triangular arrangements which remain stable are theoretically possible among astral bodies but this is the first example of an

actual triangular positioning so far known. *Achilles*, the first of the Trojans, was discovered in 1906 by the German astronomer *Franz Joseph Wolf*. About 1000 Trojans are now known. The Trojans are the darkest of the asteroids.

Earthgrazers. Some asteroids in their orbits round the sun come dangerously close to the Earth (in astronomical dimensions). They are called *earthgrazers*. *Eros*, first identified by photographs in 1898, is the first

First Ten Asteroids

Name	Year of Discovery	Mean distance from sun (million miles)	Orbital period (year)	Diameter (miles)
Ceres	1801	257.0	4.60	485
Pallas	1802	257.4	4.61	304
Juno	1804	247.8	4.36	118
Vesta	1807	219.3	3.63	243
Astrea	1845	239.3	4.14	50
Hebe	1847	225.2	3.78	121
Iris	1847	221.4	3.68	121
Flora	1847	204.4	3.27	56
Metis	1848	221.7	3.69	78
Hygeia	1849	292.6	5.59	40(?)

* Of these, 1562 were discovered by two German astronomers, Wolf (582) and Reinmuth (980)

of the earthgrazers to be discovered. It may come as close as 22 million km (14 million miles). Another asteroid *Hermes*—just 1000 feet across—passed within 485,000 miles of the Earth in 1937. *Icarus*, a lump of rock almost a mile in diameter, came within 4

million miles of the Earth in 1949 when it was first discovered. It repeated the performance in 1968. *Geographus*,† a curious cigarshaped rock about 2½ miles long and half a mile wide (discovered in 1951), came within 5.6 million miles of the Earth in 1969.

20. METEORIODS

Meteoroids are lumps of solid matter that cross the inter-planetary space in endless numbers. The word 'meteoroid' is a general term that includes meteors, fireballs, meteorites and micrometeorites. Meteoroids are usually very small in size, considerably smaller than the asteroids.

Meteoroids' source is not exactly known. It is thought that they are broken pieces of comets or bits of disintegrated asteroids.

Meteors, commonly known as 'shooting stars', are meteoroids that pass through the atmosphere and become hot enough to emit light. They are heated as they pass through the air by a process of compression. Unconfined (free) air cannot move faster than the speed of sound, while meteoroids tear through it at 30 to 60 times the speed of sound. This naturally causes compression of the surrounding air which gets heated. Much of this heat is absorbed by the passing meteoroids which shine as meteors shooting stars.

Meteor Showers. These are supposed to be fragments of comets. They come down in clusters and get burnt out in the atmosphere thus giving the appearance of a shower. In 1964, the comet *Giacobini-Zinner* passed close to the Earth missing a collision by about ten days. The Earth, however, passed through the broken fragments of the comet, with the result that the sky teemed with shooting stars. Meteor showers, that recur periodically, are apparently remnants of disintegrated comets. The *Perseid* shower which occurs annually in August is taken to be remnants of *Tuttle's* comet, first discovered in 1871. The *Leonid* shower which falls every 33 years is suspected to be fragments of *Temple's* comet. The *Leonid* shower of 1833 is the greatest meteor display we have so far seen.

Fireballs, so called, are exceptionally bright meteors. Some think that fireballs

have a different origin from that of the ordinary shooting stars. They are supposed to come from the belt of asteroids.

Every day millions of meteoroids pass into our atmosphere but not more than one or two a day survive the compression and strike the Earth as meteorites. The rest are burnt up in the atmosphere or reduced to meteoric dust. The largest meteorite known is imbedded in the ground near *Grootfontein* in S.W. Africa. It is estimated to weigh 70 tons. The second largest, weighing some 34 tons, was recovered by *Admiral Peary* from Greenland. It is now on exhibit at the *Hayden Planetarium* in New York. Though no meteorite larger than the *Grootfontein* is known to exist, the Earth must have been struck by bigger meteorites. This is evidenced by large meteoric craters that exist today. The largest of such craters known is at *Lac Couture*, Quebec, which is more than 9 miles across. The crater lies submerged in a lake.

Meteorites are broadly divided into three groups which differ widely in both appearance and properties. (1) Stones or *Aerolites*, (2) *Iron or Siderites* and (3) *Stony-irons or Siderolites*. The chief elements in stone meteorites are Oxygen, Silicon, Iron, Magnesium, Sulphur and Nickel. Iron meteorites are practically an alloy of Iron, Nickel (7 to 8%) and Cobalt (about 0.5%). Graphite, Iron Sulphide and Phosphorus are also found in varying quantities in Iron meteorites. Sometimes, even diamonds are found. The stony iron meteorites contain besides iron and nickel, a number of silicon

† So called after the National Geographic Society

minerals, in varying proportions.

Micrometeorites. The smallest meteoroids are called micrometeorites. They are so small that they do not become incandescent by compression and drift slowly down to the Earth in their original forms. Huge quantities of this meteoric dust fall on the Earth year after year. It is estimated that meteoric dust falling on the Earth will add up to more than 2 million tons of dust every year.

Tektites are believed to be extra-terrestrial material and are therefore classed with meteorites. They resemble glass pieces.

Chemically they resemble nothing on Earth but their most interesting feature is that they appear to have had a fiery high speed journey through our atmosphere. Their surfaces are etched and pitted by atmospheric friction—by a process called ablation. Usually about the size of gravel, tektites are found in widely separated regions of the world known as 'skewn fields'. The exact source of these tektites is unknown.

The largest tektite of which details are available is the one found in Laos, *circa* 1932. It weighs 7.04 lbs and is now in the Paris Museum.

21. SPACE EXPLORATION

Space exploration is almost three decades old now. It started with Russia's 'Sputnik' and America's 'Explorer'. Man reached Moon in 1969 to walk on lunar soil. Then came the Space Stations called the 'Skylab' and the 'Salyut'. Man learned to walk in space without tethers and retrieve and repair lost satellites.

Space travel has opened up a new dimension in man's study of the Universe. Astronomers can now photograph in close-up the Moon and planets, which 20 years ago they could only see dimly through the dense blanket of the Earth's atmosphere. Even though observatories have been established on mountains 2,000 m. (6,600 ft) or more in height astronomers on Earth are still hampered by the blurring and filtering effect of the atmosphere that remains above the mountains. Only by going into space can they achieve the clearest view of the sky, and also detect radiation, such as X-rays or ultra-violet light, that is blocked by the highest levels of the atmosphere.

Because space satellites make it possible to detect radiation from outer space at wavelengths formerly out of range, astronomy is undergoing a revolution similar to that which followed the invention of the telescope. Most spectacular of the new objects being studied are the pulsing, bursting, and erupting sources observed by X-ray satellites, caused as matter pours from ordinary stars on to small, compressed *Neutron Stars* or, in some cases, *Black holes*, orbiting them.

The First Sputnik. The Space age

began on October 4, 1957, when Russia launched *Sputnik 1* into orbit, and this was followed a month later by *Sputnik 2* which carried the dog *Laika*. Measurement of the animal's heartbeats, temperature and other reactions, radioed to Earth, suggested that human beings might also survive prolonged periods in space.

The first US satellite, *Explorer 1*, did not follow until January 31, 1958, but its instruments made the first major discovery of the space age - the Van Allen radiation belts around the Earth, where electrons and protons from the Sun are trapped by the Earth's magnetic field. Soon after, probes were sent to explore the Moon and planets, and on the way they detected the *Solar Wind* of sub-atomic particles streaming from the Sun.

Mankind's first look at the Moon's far side came with the pictures from the Russian *Luna 3* in October 1959; the US *Mariner 2* in 1962 flew past Venus, confirming both its high temperature and the reverse direction of its rotation which had been suspected by astronomers. In 1965, *Mariner 4* sent back remarkable photographs revealing craters on Mars. The work of the early space probes has been extended and improved by later planetary explorers, culminating in remote-

SPACE FIRSTS

- First man to propound the space flight laws: Sir Issac Newton (1642-1727) in his book 'Mathematical Principles of Natural Philosophy'.
- First artificial Satellite put into orbit: USSR's 'Sputnik' ('Fellow Traveller'), Launched on October 4, 1957 and weighing 83.6 kg., it attained an altitude of 2285.9 km at a velocity of 28565 Km/h.
- First Manned Satellite: USSR's Col. Yuri Gagarin took off in a 4.65-ton space Vehicle 'Vostok' ('East') on April 12, 1961 to complete a single orbit of the Earth in 89.34 Mins.
- First woman in Space: USSR's Lt. Col. Valentina Tereshkova went to space in 'Vostok 6' on June 16, 1963. She completed 48 orbits in 2 days 22 hr. 42 min. Svetlana Savitskaya of USSR became the 2nd woman on Aug. 19, 1982 and Sally Ride of U.S. the 3rd woman on 18 June, 1983.
- First 'Walk' in space: Astronaut Edward H. White floated free outside the space vehicle, 'Gemini IV', for 21 minutes on June 3, 1965.
- First Indian to reach space: Sq. Ldr. Rakesh Sharma in joint Indo-Soviet flight on 3rd April 1984 along with two Soviet cosmonauts.

controlled landings on the Moon, Venus and Mars – the last in a search for the possibility of life.

Probes are now swooping closer to the Sun than ever before to study solar activity, while others are pushing the boundaries of exploration out to *Jupiter* beyond. Plans are being made for a probe to intercept one of those ghostly wanderers of the solar system, the comets.

Manned Missions account for only 3% of the 2,400 or so spacecrafts which were launched in the first 23 years of the space-age. The first man to be launched into space was the Russian *Yuri Gagarin* who orbited the Earth once on April 12, 1961. Later Russian cosmonauts, including the first space woman, *Valentina Tereshkova*, (June 16,

1963) were able to stay in orbit for up to five days.

American astronauts made more modest flights in their smaller *Mercury* spacecraft, but in 1965 began the series of two-man *Gemini* flights that overtook the Russian lead in the space race. The team of astronauts in the Gemini programme practised rendez-vous manoeuvres, docking procedures and space walks in preparation for the coming *Apollo* missions to the Moon.

In a Gemini capsule the astronauts had less space than in the front of a small car. The three-man *Apollo*, however, was relatively roomy, with sufficient space for the crew to move about and even to stand upright. The vital part of *Apollo* so far as landing on the Moon was concerned was the four-legged *Lunar Module*, in which two men touched down on the Moon. *The first Moon landing, by Neil Armstrong and Edwin Aldrin from Apollo 11, took place on 21 July, 1969.*

Exploring the Moon. A total of 12 Americans walked on the Moon during the *Apollo* programme, bringing back 380 Kg of rocks and soil. These samples from the Moon, along with scientific measurements made on the surface and from the orbiting mother craft, have helped scientists to piece together a detailed picture of our nearest neighbour in space.

Although no more Moon trips are currently planned, men will eventually return to the Moon, probably setting up small scientific bases like those in Antarctica, from which geologists will continue their study of the Moon and astronomers will observe the sky. Such 'colonies' might also mine the Moon's crust for minerals.

Eventually, *a manned flight to Mars* may be planned, although not before the beginning of the next century. A round-trip to Mars would take a year or more, and would probably be undertaken by a crew of six, flying in two spacecrafts. Possibly the Mars flight will be a joint venture, with cost and construction shared between two or more nations, in the same way that the USA and Russia worked together to achieve the *Apollo-Soyuz link-up* in July 1975.

Incidentally NASA Scientists announced in October 1985 that Mars has significantly more

Dinosaurs Burnt Up

SCIENTISTS say they have discovered the first direct evidence, 65-million-year-old soot, that fire once swept the world and contributed to the mass extinctions of dinosaurs and many other forms of life.

In a report in the journal Science, published on October 4, '85, chemists of the University of Chicago said the "surprisingly large amount" of soot appeared to be worldwide and could only have been produced in flames or hot gases. They said it represented a fallout from a dense smoke cloud that must have brought a killing darkness and chill to the world.

From the soot residue, found in ancient sediments, the Chicago chemists theorised that the firestorm was ignited by the impact of a huge asteroid or comet.

The findings were seen as further evidence supporting the hypothesis, advanced in 1979, that an extraterrestrial object struck the Earth with such violence 65 million years ago that the airborne debris of dust, rock and vapour cast a pall over the world.

The soot discovery introduced another lethal factor, fire, to the scenarios of catastrophe. The conflagration set off by the impact probably destroyed much of the world's vegetation, the chemists surmised.

It was this discovery, since reinforced by findings at more than two dozen other sites around the world, that led Dr. Luis W. Alvarez, a Nobel prize-winning physicist at Lawrence Berkeley Laboratory, and his son, Dr. Walter Alvarez, a geologist at the University of California at Berkeley, to their asteroid-impact hypothesis to explain the mass extinctions 65 million years ago.

(Source: New York Times)

water than was once thought and is still undergoing seasonal changes similar to those on Earth. They say that Mars once had a thicker atmosphere, substantial volcanic activity and enough water possibly to cover it with an ocean 10 to 100 metres deep.

At the dawn of the space age, doctors were concerned that men might not be able to survive the weightless conditions in space without ill-effects. Experience has shown, however, that astronauts can work efficiently in space for up to six months, the time spent aboard the *Salyut 6* space station by two Soviet spacemen in 1980. The body begins to acclimatise after a few weeks in space, and regular exercise prevents any dangerous long term changes such as wasting of the muscles and bones and weakening of the heart that might otherwise occur. Missions lasting a year can eventually be expected.

Experiments in Space. In the *Skylab* space station, and its smaller Russian counterpart called *Salyut*, astronauts have begun to extend the surveys of Earth resources and astronomical observations begun by satellites. The three *Skylab* crews, each of three men, brought back a total of 72 Km (45 miles) of magnetic tape logging instrumental results, 46,000 Earth resources pictures, and 175,000 images of the Sun taken through the special *Skylab* solar telescopes.

Space stations allow scientists and engineers to take advantage of the conditions of weightlessness and total vacuum when developing new manufacturing processes. Without gravity, for example, perfect crystals can be grown of materials for electronic components such as transistors. Materials that do not mix under gravity, for example oil and water, form a perfect blend in weightlessness.

Metals can therefore be fused, then cooled and solidified to make new alloys unattainable on Earth. Space conditions can also be used to produce ultra-pure chemicals such as vaccines, or make possible studies of cell growth that may throw new light on biological malfunctions such as cancer.

Space Shuttle. Before the promising applications of space can be fully exploited, the cost of space launches must be brought down. This has been the incentive for the development in the USA of a new transport-

Made in Space

There have been many predictions about the super-pure pharmaceuticals and flaw-free alloys that will eventually be made aboard factories in space. The first sales of a product actually manufactured in space were announced by the U.S. Department of Commerce's National Bureau of Standards (NBS) on July 17, 1985. The "Commercial" space products were millions of clear plastic balls made aboard a NASA manned space vehicle.

The products, tiny polystyrene spheres are 10 micrometers (roughly 1/1,000th of a centimeter) in diameter – so small that 18,000 of them could fit on the head of a pin. They can be seen only under a microscope. The spheres were purchased by producers of finely ground products – paint pigments, inks, toners, chemicals, and other cosmetics – as well as by technologists who monitor environmental particulate pollution from industrial and chemical plants.

The spheres also will be calibrate instruments to count blood cells and measure their shape and to perform a wide variety of diagnostic measurement.

Moreover, the new product is available to manufacturers as a reference to improve microscopic measurements in electronics and other high-technology areas.

The spheres were produced aboard the Space Shuttle "Challenger" using a chemical process developed for NASA by Lehigh University. It was decided to manufacture the spheres in space because Earth-bound processes have not yielded sufficiently uniform materials in usable quantities. When produced in a low-gravity environment, the polystyrene spheres grow uniformly in size and shape.

NASA Administrator James M. Beggs said that "this material is the first of what we expect will be a long line of products to carry a made-in-space label. Pure pharmaceuticals to fight age-old diseases; perfect crystals, larger than any made on Earth, for use in electronic components; thin films for industrial use; new alloys – all are among the promising and potentially profitmaking products that could become realities soon...."

(Source: Economic Impact 1985)

tation scheme called the *Space shuttle*. The Shuttle's main component is a re-usable spacecraft, the *Orbiter*, which is launched by means of rockets but can glide back to Earth like an aircraft, landing on a runway.

The winged Shuttle Orbiter is the size of a modern jetliner, with a cargo bay 18.3 m. (60 ft) long and 4.6 m. (15 ft) wide which can carry up to 29.5 tonnes into orbit. The shuttle can therefore launch several satellites at a time, and bring others back to Earth, if necessary, for repairs.

The European Space Agency is building a small space station known as *Spacelab*, to be flown in the Space Shuttle's cargo bay. In *Spacelab*, scientists and engineers from many nations will be able to make observations of the Earth and sky, and perform biological and engineering experiments, continuing the work begun in *Skylab*.

Each Shuttle Orbiter will be re-used up to 100 times and is expected to be flown every month or two, largely replacing conventional rockets which can be used once only. It is hoped that the Shuttle's re-usability will bring down the cost of space missions by about 90%. The Shuttle Orbiter's first test flight into orbit, with a crew of two, took place successfully in April, 1981.

Space Station. While the American dream of monthly Space Shuttle Service eluded immediate realisation, Soviet Union continued what appeared to be a steady progression towards the ultimate establishment of a large multimanned Space Station. Soviet experimentation with the launching of cosmos 'Space tugs', manned and unmanned, and docking with *Salyut* Space Station continues unabated.

The first Space Shuttle 'Columbia' reached

orbit on April 12, 1981 - the 20th anniversary of man's maiden trip to Space. Shuttles Columbia, Challenger, Discovery and Atlantis achieved many firsts in space exploration and research. Shuttle 'Challenger' took Sally Ride, the first U.S. woman, to space on June 18, 1983. The first night flight, launched on August 30, 1983, carried also America's first black, Guion S. Blueford, who performed space exercises under the eye of Space Physician William Thornton, aged 54, the oldest astronaut to make a space journey.

Atlantis, the fourth and final member of the NASA's Shuttle fleet was launched on October 3, 1985. It deployed two bomb-shielded, jam-proof Air Force Communication Satellites.

Space Repair. In November 1984 Shuttle succeeded in retrieving two malfunctioning Satellites, namely Palpa B-2 and Westar-6. These Satellites could be used again. Shuttle made successful retrieval and repair of Satellite Solar Max in April, 1984. For this historic feat astronauts had to get out of the Spacecraft and 'walk on space' for as long as 6 hours and 44 minutes.

'Discovery' completed a secret military mission on Jan. 28, 1981 when it launched the first of the four Spy Satellites against Soviet Union called SIGNIT (Signal Intelligence). These reconnaissance satellites will peep into Soviet territory day and night. They can sense the movement of even a small vehicle in the dead of night.

The U.S. has spent no less than Rs. 30,000 crores for the Shuttle programme from 1972 till 1985. The U.S. had originally planned to complete 500 Shuttle trips by 1991. But, it became evident that this ambitious target would not be achieved because of various reasons. According to NASA's re-schedule, they would be able to complete 165 flights by 1991. This itself will be no mean achievement. The US plans to construct a new launching pad at Cape Canaveral and another one at Vandenburg, California.

NASA predicts that a permanent base on the Moon will be established by A.D. 2010 and they have formed a Lunar Base Working Group.

Junkyard. Side by side with all these

forays, space has become a junkyard of hundreds of man-made crafts. While many of these satellites are still operating, many are dead or defunct. *One of these satellites was the target of Reagan's Anti-satellite experiment in September 1985 when it was destroyed by a small two-stage missile with a rocket motor warhead.*

The most colourful one of USSR's Space Programmes is the design of a *Space City*. They visualise taking pre-fabricated blocks to space and join them together there. The city will enable scientists of many specialisations to work side by side in the same arena.

Four Soviet Cosmonauts returned to Earth on October 2, 1984 after establishing a new record in space living. Leonid Kisum, Vladimir Solovyov and Oleg Atkov lived and worked abroad Salyut-7 for 237 days. The Space Station, brought to near-earth orbit on April 19, 1982, is continuing its orbit.

European Challenge. The European Space Agency, an 11-country consortium is all set to challenge the U.S. supremacy in the commercial use of space through shuttle trips. Enthused by the success of their Ariane rockets, they are planning for a new generation of powerful rockets, a reusable manned spaceship called Hermes, a European Space Station and a new series of satellites for Earth observation and communication.

China announced in June 1985 a new commercial space programme using its own satellites, launching rockets, and ground stations. The Chinese, who have launched 16 successful spacecrafts since 1970, now have rockets capable of boosting satellites into the high orbit favoured for communications satellites.

Emphasising the export potential of space technology, Japan is also developing its own rocket launching capability and planning to launch in 1986 the first of a series of ocean and land remote-sensing satellites.

France is to use the Ariane to inaugurate the world's first commercial remote-sensing satellite service, competing with the American *Landsats*, which survey the world's geological, water, and agricultural

resources.

India entered the Space Age in 1963 and Brazil is building a new rocket base with the

intention of becoming the first South American launching power.

(India's Space Programme: See *India*)

22. THE EARTH

The earliest systematic theory of the Earth was the geocentric (geo=Earth) theory. According to this theory, the Earth was the unmoving centre of the universe, round which the Sun and the stars and all other heavenly bodies revolved.

One of the earliest proponents of this theory was Euodoxius of Cnidos, Circa(Hallies) 360 B.C. Many Greek philosophers disagreed with this view. Aristarchus of Samos (310-230 B.C), for example, held that "the fixed stars and the Sun remained unmoved, that the Earth revolved round the Sun on the circumference of a circle, the Sun lying at the centre of the orbit". However, the ideas of Aristarchus and others like him never gained currency.

The final formulation of the theory was made by Claudius Ptolemy, a Greek astronomer of Alexandria. He brought out an encyclopaedic work on astronomy in about 140 A.D. This work, later known by its contracted Arabic name *Almagest*, remained the Bible of astronomy for another 1400 years. Looking back, it seems incredible that such a fallacious theory should have ruled for so long a time. Actually, the theory enjoyed this longevity, because it had two attractive features. First it agreed with the apparent (not real) movements of the heavenly bodies. This satisfied the popular minds. Second, it flattered man's vanity to think that his abode—the Earth—was the centrepiece of the universe.

Heliocentric Theory. The heliocentric theory (helios=sun) was first advanced by Nicolaus Koppernigk (1473-1543), a Polish astronomer, better known by his Latinised name Copernicus. In 1543 Copernicus published a book *De Revolutionibus Orbium Coelestium* in which he set out the theory that the Sun was the centre of the universe and that the Earth and other planets revolved round it. Wrote Copernicus, "In the middle of all dwells the Sun. Who indeed, in this most beautiful temple, would place the torch in any other or better place, than one, whence

it can illuminate the whole at the same time? Not ineptly, some call it the lamp of the universe, others its mind, others again its ruler..."

Like all other astronomers of the day, Copernicus believed that the solar system was equivalent to the universe. This was a mistake which was corrected only in recent times. He was also mistaken in assigning circular orbits to the planets. This mistake was corrected by the German astronomer Johann Kepler (1571-1630) in 1609. For the rest, the Copernican theory was sound and unassailable.

Nevertheless, the theory faced stormy weather. For the better part of a century disputations went on between the Copernicans and the Ptolemians, with the Copernicans remaining on the defensive. Even the Danish astronomer Tycho Brahe (1546-1601), the most celebrated astronomer of the times, rejected the heliocentric concept. It was left to the Italian astronomer, Galileo Galilei (1564-1642) to save the Copernican theory from extinction. Galileo fought a lifelong battle in defence of the Copernican system. Before he died he had the satisfaction of knowing that the tide had turned and that the Ptolemians were on retreat.

Sir Issac Newton (1642-1726) dealt the last blow at the geocentric theory. He formulated the law of gravitation and correlated it with his laws of motion. His book *Philosophiae Naturallis Principia Mathematica* (known shortly as *Principia*) marks a turning point in the history of astronomical thought.

Modern theories of the formation of the Earth and other planets are of course based on the Copernican theory. In 1749, the French naturalist Comte de Buffon argued that the planetary system originated as the result of a collision between the Sun and a

comet that came out from the depths of space. In 1775 the German philosopher Immanuel Kant advanced what has since been known as the nebular hypothesis. He suggested that the Earth and the other planets were condensed from a rotating nebula of gas centred in the Sun (solar nebula). The French mathematician Marquis de Laplace supported the nebular hypothesis in 1796. Around 1900 two American astronomers, T.C. Chamberlin and F.R. Moulton, offered an altered version of Buffon's theory. They argued that a star (not a comet) passed by the Sun and drew out the material that later condensed into planets.

Neither Buffon's thesis nor that of Chamberlin and Moulton could hold out for long. But Kant's hypothesis received further support. In 1943 the German scientist von Weizacher came out with a restatement of the nebular hypothesis. He was supported by the American astronomer Kupier. They argued that the entire solar system originated from a massive wheeling cloud of gas and dust some 6 billion years ago. The central mass of this rotating disc of gas formed the Sun. Because of its intense pressure and temperature, the Sun produced light, heat and other radiation through nuclear reaction. The clouds on the periphery of the central mass (Sun) condensed to form the planets and other celestial bodies of the solar system— all of which were held together by the gravitational pull of the Sun.

Age of the Earth. The age of the earth was a matter of speculation till very recent times. Imagination played a very great part in this process. Naturally, the conclusions varied greatly. Thus an old Russian calendar put down the age of the Earth at a mere 2000 years, while a Hindu calculation (quoted by Prof. Arthur Holmes) put it down at 2000 million years. In 1658, an Irish bishop, James Ussher, set out to fix the exact age. He calculated on the basis of the Bible that the Earth was created on Sunday, the 23rd October, at 9 a.m in the year 4004 B.C.

It was only about 200 years ago, that scientific enquiries were started by geologists. According to their deductions, based on the study of rocks, the age of the Earth is estimated to be around 4600 million (4.6 billion) years.

Earth Data

Superfical area	196,950,000 sq. miles
Land surface	57,510,000 "
Water surface	139,440,000 "
Equatorial Circumference	24,902 miles
Meridional circumference	24,860 "
Equatorial diameter	7,926,677 "
Equatorial radius	3,963.34 "
Mean distance from the Sun	92,857,000* "
Time of Rotation on its own axis	23 hrs. 56 min., 4.09 sec
Period of Revolution round the Sun	365 days 5 hrs. 48 min., 45.51 sec.
Inclination of the axis to the plane of the ecliptic	23°27'
Speed of Rockets (that is, velocity required to counter earth's gravity and to rise up into the atmosphere)- A minimum of 8 km (5 miles) per second.	
Escape Velocity (that is, speed necessary to break away from the earth into outer space)- 11 km (7 miles) per second	

* (This is now known as Astronomical Unit A.U.)

Structure. Our knowledge of the internal structure of the Earth is derived from studies of earthquakes. The shock waves sent out by an earthquake indicate the physical nature of the regions through which they pass. These studies show that the centre of the Earth is a solid core—the *Inner Core*. The density of this core is about 13 gm to the cubic centimetre. The Inner Core is about 1300 km thick and is surrounded by an *Outer Core* of around 2080 km. The Outer Core appears to be molten.

The Outer Core is surrounded by the Mantle which has a thickness of around 2900 km. The Mantle is topped by the crust of the Earth, which varies widely in thickness—from 12 to 60 km. At the centre or the Inner Core, that is at a depth of some 6370 km temperature goes up to some 4000°C and pressures reach nearly 4 million atmospheres.† (See *Air Pressure- Atmosphere- infra*).

The Mantle. The mantle is important in many ways. It accounts for nearly half the radius of the Earth (2900 km), 83 per cent of its volume and 67 per cent of its mass. The

dynamic processes which determine the movements of the crust plates are powered by the mantle.

Starting at an average depth of from 45 to 56 km below the top surface of the Earth, the mantle continues to a depth of 2900 km where it joins the outer core. The mantle is a shell of red hot rock and separates the Earth's metallic and partly melted core (both the inner and the outer cores) from the cooler rocks of the Earth's crust. It is composed of silicate minerals rich in magnesium and iron. The density of the mantle increases with depth from about 3.5 grams per cubic centimetre to around 5.5 grams, near the outer core.†

The upper portion of the mantle, about 250 km thick, is called the *Asthenosphere*. Here the rocks are partially melted, with thin films of liquid distributed between the mineral grains. The red hot nature of the lower mantle and the partially melted nature of the upper mantle (asthenosphere) combine to make the whole mantle plastic or yielding. It is on this plastic base that the top crust of the Earth (consisting of oceans and continents) that is to say, the lithosphere, rests. The lithosphere is distinguished from the asthe-

nosphere by the fact that it is cooler and therefore more rigid.

The crust of the earth which tops the lithosphere virtually floats on the asthenosphere. Like other floating bodies the crust seeks and equilibrium riding deeper where it is heavier and rising higher where it is lighter. The mountains on the crust have deep roots of light material to support them and when the load on any part of the crust changes, the surface responds by rising or sinking to restore the equilibrium.

The Outer Surface. The outer surface of the earth is divided into four spheres. 1. *Lithosphere* means the entire top crust of the earth and includes not only the land surface but also the ocean floor. 2. *Hydrosphere* is the water surface which includes the oceans, lakes and rivers. It rests on the lithosphere.

3. *Atmosphere* is the blanket of air that envelops the earth. It covers both the land surface and the water surface. 4. *Biosphere* is the sphere of life which spreads over all the three other spheres, lithosphere, hydrosphere and atmosphere.

23. LITHOSPHERE

The lithosphere is the top crust of the earth on which our continents and ocean basins rest. It is thickest in the continental regions where it has an average thickness of 40 km and thinnest in the oceans where it may have a maximum thickness of 10 to 12 km. It constitutes about 1 per cent of the Earth's volume and 0.4 per cent of its mass.

Though the lithosphere technically includes both the land mass and the ocean floor it is often used to indicate only the land surface, especially where it is sought to be distinguished from hydrosphere or the water surface. Regarded thus, the lithosphere forms only 3/10 of the total surface of the Earth. The rest 7/10 is taken up by the oceans.

Land Surface. As we see it today, the topmost portion of the land surface is sand and soil* except where rocky outcrops show.

†Source: *Scientific American*

* Soil is distinguished from sand because soil contains humus or decomposed organic matter (dead leaves, roots etc.) which provides nutrients for plants. Sand as such does not contain humus

All the sand and much of the soil that we see have been derived from ancient rocks. The rocks themselves were originally formed from the molten magma, which erupted from the interior of the earth. Powerful earth movements have heaved up some of the rocks to the top surface, where they have been exposed to climatic influences. The process by which rocks are broken down into sand is known as 'weathering'. Many factors operate to weather down the rocks, of which the most important is 'weather' itself.

When rocks heated hot by the Sun are suddenly cooled by rain they crack. When the process goes on for thousands of years big rock formations crumble down as sand

Continents

Name	Area sq. miles	Percentage of Earth's area	Population Estimate	Highest Point in feet	Lowest Point in feet
Asia	16088000	29.5	2316312000	Everest 29028	Dead Sea 1302
Africa	11506000	20.0	401000000	Kilimanjaro 19340	Lake Assai 512
N. America	9390000	16.3	342700000	McKinley 20320	Death Valley 282
S. America	6795000	11.8	219000000	Aconcagua 22834	Valdes Penin 131
Europe	3745000	6.5	660313000	Elbrus 18510	Caspian Sea 92
Australia†	2968000	5.2	13800000	Kosciusko 7310	Lake Eyre 52
Antarctica	5500000	9.6	-	Vinson Massif 16860	

† Australia with New Zealand, Tasmania, New Guinea and the Pacific islands, (Micronesian, Melanesian and Polynesian Islands) is called *Australasia* by some geographers while some others call it Oceania.

Similarly frost can break down rocks. Water caught in the crevices of rocks turns to ice in winter conditions and expands. This pressure often cleaves rocks. These and other conditions have combined to produce the land formations that we see today.

Rocky Substructure. The contours of the landscape are largely conditioned by the rocky substructure of the lithosphere. Geologically speaking, all materials that make up the crust of the Earth are rocks, whether they are big granite boulders, combustible coal, soft clay or loose fragments of gravel or sand. Rocks which form the lithographic substructure may be broadly grouped into three classes- 1. *Igneous rocks*, 2. *Sedimentary rocks*, and *Metamorphic rocks*.

Igneous rocks are formed out of the molten magma from the interior of the earth. Ninety-five per cent of the earth's crust is made up of these rocks. Three types of igneous rocks may be noticed here, *Granite*, *Basalt* and *Volcanic*. Granite is the major rock in continental formations. Basalt largely occurs in ocean beds. Volcanic rocks, as the name implies, are formed from the molten lava ejected by volcanoes.

Sedimentary rocks are so called because they are formed from the sediments deposited in the ocean beds. They comprise only 5 per cent of the Earth's crust but cover about 75 per cent of the land surface. Sedimentary rocks are not important structurally but economically. It is from these rocks that we get our coal, oil and some valuable minerals. Sedimentary rocks are mainly made up of the weathered remains of igneous rocks but

they also contain much organic matter formed from the remains of microscopic marine organisms and dead wood or other vegetable matter. Sedimentary rocks are formed in horizontal layers called strata and take millions of years to harden into rocks. Once formed, these rocks are often rolled up or deformed and shifted about by earth movements and are sometimes located in the most unlikely places, the top of the Himalayas, for instance.

Metamorphic rocks are rocks transformed by the action of intense heat or great pressure or chemical activity on rock formations *in situ*. Both igneous and sedimentary rocks are liable to be metamorphosed. Metamorphism is often associated with volcanic activity or the extrusion of molten or hot gases into pre-existing rock formations. Marble, for example, is formed by the action of intense heat on limestone. Slate is formed from the compression of shale and mudstones.

The Lithosphere is divided into twelve climatic regions.

Continental Drift. We know that the face of the Earth, that is, its visible surface has undergone radical changes in the past. Geologists explained these changes as the consequences of the cooling and contraction of the Earth, through thousands of years. This explanation seemed quite unsatisfactory to a German scientist, Alfred Wegener (1880-1930). In 1915, Wegener published a book *The Origin of Continents and Oceans* in which he advanced a new theory, the theory of *Continental Drift*.

This theory claimed that the changes in the appearance of the Earth were, in the main, due to the shifting of continents. Wegener grounded his theory primarily on two premises. First, that the geological formation and fossil remains of the present far away continents showed striking similarities. Second, that some of the continents showed astonishingly complementary coastlines. The east coast of South America, for example, matches the west coast of Africa, so finely that they would fit together exactly, if they were brought together.

Wegener was no geologist. He was a qualified astronomer who practised meteorology. Though one or two geologists—Prof. Arthur Holmes, for instance—supported him, the majority of the geologists condemned his theory as absurd. Wegener died a discredited man. But researches in oceanography in the sixties clearly showed that the theory of continental drift was substantially right. It is now generally accepted that the continents, far from being immutably fixed in their positions, have been constantly on the move throughout geological history and are still shifting.

Whither Continents?



180 m. years ago



65 m. years ago



135 m. years ago



Present

Once upon a time, say 200 million years ago, our continents were lumped together into one huge land mass called Pangaea. Then they separated and started drifting, until they have become what they are today. But they have not stopped moving even now. They continue in their age-old motions. Will they come together back again as Pangaea? No one knows. One thing, however, is certain. The configuration of Continents will be completely different in another 50 million years.

A generally accepted forecast of the shapes and positions of continents 50 million years hence is the following. Australia will push on northward to come alongside of Malaysia and collide with Asia. Such a collision will spawn Earth movements more gigantic than the collision of India with Asia some fifty million years ago. Africa will continue to edge towards Europe. This will convert the Mediterranean into a series of inland lakes. The sea will invade the African Rift Valley and segregate East Africa from the mainland of Africa. The Bay of Biscay in Europe will close up. The Atlantic and the Indian Oceans will expand and the mighty Pacific will shrink. Lower California and such parts of California which lie to the west of San Andreas Fault will move towards Alaska. Los Angeles, the city of dreams, will go down the Aleutian trench and disappear into the mantle of the Earth.

24. EARTHQUAKES

Earthquakes are of two kinds, *Volcanic and Tectonic*. Volcanic earthquakes are caused by the eruption of volcanoes. On land, they are localised around the volcanoes and therefore do not cause extensive damage. But, in the sea, these earthquakes can give rise to tidal waves, which travel across the oceans and destroy shorelines far away. The quake that devastated Mexico City and killed a few thousands there in September 1985 was Tectonic.

Tectonic earthquakes are caused by shifts in the rock structure of the Earth. They affect vast areas and cause extensive damage. When large basins of rock structures are subjected to stress, they bend as far as their elasticity would permit. Beyond this point, they break with a rebound. This causes earthquakes.

Earthquakes occur in regions of marked instability of the Earth's crust. It is now known that plate boundaries form such unstable regions. Earthquakes may arise for a variety

of reasons. Some tensional earthquakes clearly arise from 'faulting', that is to say, from Transform faults which are found all along plate boundaries. Some others arise from the arching of the lithospheric crust as converging plates press hard against each other. Others may result from the tearing of the lithosphere under high pressure. In short, earthquakes abound wherever the edges of

Earthquakes

Country	Years			
China	1057, 1932,	1290, 1964,	1556, 1975,	1920,
Japan	1293, 1946,	1528, 1948,	1703,	1923
India	1737	(Calcutta),	1819	(Cutch),
	1819	(Assam),	1897	(Assam),
	1905	(Kangra),	1916	(Nepal),
	1934	(Bihar),	1935	(Assam),
	1935	(Quetta),	1937	(Calcutta),
	1950	(Assam),	1967	(Koyna),
	1975	(Himachal Pradesh),		
Iran	1775,	1957,	1962,	1963,
	1968,	1978,	1981,	
Turkey	1268,	1822,	1939,	1946
	1953,	1971,		
Chile	1906,	1939,	1960,	1965.
Peru	1868,	1970,		
Ecuador	1797,	1868,	1949,	
USA	1811-12,	1906,	1964,	
Italy	1693,	1783,	1908,	1915.
Portugal	1531,	1775,		
Mexico	1985			

(For details of Mexico City quake: See Disasters in Part II)

Seismic Waves

R.D. Oldham who was the Director General of the Geological Survey of India in 1897 was the first geologist to distinguish different seismic waves and interpret them. Oldham distinguished three main types of waves - (i) P waves or primary waves. (ii) S waves or secondary waves and (iii) Surface waves.

P waves are compression or expansion waves like those of sound, S waves vibrate at right angles to the direction of travel as 'light waves' do and Surface waves appear in the upper 20 miles or so near the Earth's surface. P waves travel at their maximum speed (8½ miles per second) at a depth of 1800 miles and at about 3 miles per second in rocks near the surface of the Earth. S waves travel at about two-thirds of the speed of P waves. But there is one distinction. S waves travel through the solid parts of the Earth only while P waves travel through the solid as well as other parts of the Earth. The speed of both varies with depths in the Earth. At the core of the Earth S waves disappear but P waves go on curving upwards to the surface.

two rigid lithospheric plates meet and jostle each other. Many of the Earth's greatest earthquakes like the Kamchatka earthquakes of 1952, the Chile earthquake of 1960 or the Alaska earthquake of 1964 occurred around such zones of high friction. Smaller zones of lesser friction produce minor earthquakes.

Seismic Belts. Such regions of the Earth as are prone to earthquakes are called Seismic Belts. The circum-Pacific seismic belt, otherwise called the *Ring of Fire*, is the most important seismic belt and includes the western coast of the Americas, the eastern coast of Asia, the islands of the South-East Pacific and New Zealand. The next important belt called the *Alpine belt* runs from the South Pacific Islands, through Java, Sumatra and other Indonesian islands, crosses the Central Asian mountains and passes on through Caucasus to Greece, Italy and Spain. A third belt – the *Atlantic belt* – runs from north to south through the middle of the Atlantic Ocean.

In India, the main earthquake belt runs along the Himalayan Ranges and southwest

to the swamps of the Ranns of Kutch. All the major earthquakes of India except the one at Koyna (Maharashtra) have occurred in this belt.

Seismic Waves. When an earthquake strikes, tremors spread outwards in two different types of seismic waves. Primary or P-waves cause any rock in their path to compress and then expand in the same direction as the waves are travelling. Secondary or S-waves move the rocks in a direction perpendicular to their path.

According to UNESCO, some 60,000 earthquakes occur annually on Earth. The great majority of these earthquakes are mild and cause only tremors. Others may cause destruction in varying degrees. The magnitude of an earthquake is measured on the *Richter scale*, devised by C. F. Richter in 1936. Earthquakes up to 6 on the Richter scale are mild affairs and do not cause serious damages. Between 6 and 8 the earthquakes can be disastrous, depending upon what part of the world is affected by it.

Plate Tectonics

The discoveries of the sixties, supporting the Continental Drift, have given birth to a new concept of geology— Plate tectonics. Tectonics simply means the study of rock structures involved in earth movemnts. Plate tectonics deals with such structures as are in the form of plates. The concept has revolutionised the study of geology in the same way as the Copernican theory has revolutionised the science of astronomy. The Copernican theory entailed a radical change in our ideas of the Earth and the solar system. Plate tectonics has worked a similar revolution in our conception of the Earth itself. It has proved that the Earth is not static but dynamic, so dynamic that it can rightly be described as 'alive and kicking.'

The Continental Drift assumed that the continents ploughed through the oceans like massive ships. Plate Tectonics tells us that it is not only the continents that are in motion, but the oceans as well. This is so, because the top crust of the Earth is not

(as we have thought) an unbroken shell of granite and basalt, but a mosaic of several rigid segments, called plates. These plates include not only the earth's solid upper crust, but also parts of the denser mantle below. They have an average thickness of 100 km (60 miles.) They float on the plastic upper mantle of the Earth, called Asthenosphere, and carry the continents and oceans on their backs like mammoth rafts.

All these plates are in constant motion relative to one another. One source of confusion in distinguishing between continental drift and plate tectonics is to assume that continents and plates are synonymous. They are not. Continents form only a part of the plates, the surrounding oceans form the rest of the plates. The continents alone do not drift or move. It is the plates containing both continents and oceans that move. So we now talk of plate movemnets instead of continental drift.

If it is a thickly populated area, heavy loss in life and property will follow. Beyond 8, the earthquakes are cataclysmic and bring in

total destruction wherever they strike. It is estimated that over 1.5 million people have died in earthquakes, since 1000 A.D.

25. VOLCANOES

We now know that volcanoes and earth-quakes are associated with plate boundaries, especially subduction zones. Subduction zones are centres of great activity and high pressures. Some of the historic volcanic eruptions have been found to be directly related to activities on plate boundaries.

Krakatoa, an Indonesian island, lay on a plate boundary in Sunda Strait, along the Java Trench. In 1883, this island sank and disappeared owing to volcanic eruption. In 1929 a new island – Ana Krakatoa – rose in the same place.

In 1963, a volcanic eruption rising from the Mid-Atlantic ridge, a plate boundary, created an island off the coast of Iceland – *Surtsey*. The force of the eruption sent up the lava above the water surface, forming an island, where there was none before. Volcanoes thus play a vital role in forming and transforming the topography of the earth.

It is not known exactly what forces create volcanoes or provide them the fuel power. The prevailing view is that volcanoes are fired by thermal plumes or hot spots which send up molten lava under high pressure. Such thermal plumes or hot spots are found distributed over the globe. They break out periodically. A thermal plume in the Pacific has been turning out volcanoes for some 70 million years. This plume has built a 1500-mile chain of volcanoes, over the Hawaiian archipelago, extending from Hawaii at one end to Midway on the other. Another chain of submerged volcanoes, over 2000 miles long called the *Emperor Sea Mounts*, has also been attributed to this plume. Both these chains have been built by the movement of the Pacific plate. As the Pacific plate moved over the plume, at about 5 inches per year, the upwelling from the plume created a steady succession of volcanoes. As the Pacific plate moved on, these volcanoes migrated with it.

Active Volcanoes. There are about 535 active volcanoes out of which nearly 80

are in the oceans. Volcanoes are said to be *active* when eruptions occur frequently, *dormant* when no eruption has occurred

Active Volcanoes

Height (feet)	Name & Location	Last Notified Eruption
19,347	Cotopaxi-Andes, Ecuador	Steams
17,887	Popocatepetl-Altiplano de Mexico	Steams
15,584	Klyvuchevskaya-Sredi- nny Khrebet. USSR	1964
14,006	Wrangell-Wrangell Mts., Alaska	Steams
13,812	Tajumulco-Guatemala	Rumbles
12,582	Fuego-Sierra Madre, Guatemala	1962
12,450	Erebus-Ross Is. Antarctica	Steams
12,224	Rindjani-Lombok, Indonesia	1964
12,060	Semeru-Java, Indonesia	1963
11,057	Mt. Etna-Sicily, Italy	1965
10,308	Agung-Bali, Indonesia	1964
8364	Mt. St. Helens, USA	1980
6760	The Peak-Tristan da Cunha, S. Atlantic	1961
4090	Kilauea-Hawaii	1961
3031	Stromboli-Island, Mediterranean	1956
568	Surtsey†-off S.E. Ice- land, Iceland	1963
510	Ana† (New) Krakatoa- Island, Indonesia	1929

† Both are volcanic islands formed in the present century – Surtsey in 1963 and Ana Krakatoa in 1929.

over a long period of years and *extinct* when no eruptions have occurred during historic times.

Aconcagua (22,834 feet), the highest peak in the Andes, South America, is an extinct volcano, *Kilimanjaro* (19,565 ft.) in Tanzania,

But volcanoes keep surprises up their sleeve, so to say. *Vesuvius*, for instance, was thought to be extinct but it sprang into unexpected activity in 1944.

Africa and *Llullaillaco* (22,057 ft.) in Chile, South America are thought to be dormant.

26. MOUNTAINS & DESERTS

Mountains are conventionally divided into four types, according to their mode of origin: Fold mountains, Block mountains, Volcanic mountains and Residual mountains.

Fold Mountains arise because the rocks in them have been buckled and crumpled by pressure. Just as a tablecloth, when pushed along a table, wrinkles up into folds, the rocks of the Earth's crust react to lateral pressure to form folds. If the pressure is very great, the folds are squeezed tightly into pleats. Further pressure will send the pleats rolling over one another. As the pleats roll up, high elevations are formed. Only massive pressures like those resulting from colliding plates can fold and mould rocks into mountains.

In fact, it turns out that all our big mountain systems have been formed by colliding plates. The *Himalayas* rose over such a colliding zone. So did the *Andes* (S. America), the *Rockies* (N. America) and the *Alps* (Europe). The Himalayas, the Andes, the Rockies and the Alps are fairly young mountains and are classed as *new fold mountains*. They have come into being, after the continental drift started with the break up of the super continent, Pangaea (See *Continental Drift*)

What are called *old fold mountains* must have been formed in the Pre-drift era long before the continental masses came together to form Pangaea. Among the old fold mountains are the *Pennines* of Europe the *Appalachians* of America and the *Aravallis* of India. These mountains had been weathered down to stumps long ago (see *pre-drift supra*)

Block Mountains come into being as a result of vertical earth movements along cracks or faults. Such movements are also caused by the pressure generated by plates. When such vertical earth movements leave a

Principal Peaks

Name	Country	Height(ft)
Mt. Everest	Nepal-Tibet	29,028
Mt. Godwin	India	28,250
Kanchenjuga	Nepal-India	28,280
Dhaulagiri	Nepal	26,810
Nanga Parbat	India	26,660
Annapurna	Nepal	26,504
Nanda Devi	India	25,645
Mt. Kamet	India	25,447
Gurla Mandhata	Tibet	25,355
Tirich Mir	Pakistan	25,263
Minya Konka	China	24,900
Mt. Communism	USSR	24,590
Pobeda Peak	USSR	24,406
Muztagh Ata	China	24,388
Chomo Lhari	India-Tibet	23,297
Muztagh	China	23,890
Aconcagua	Argentina	22,834
Ojos del Salado	Argentina-Chile	22,532
Cerro	Argentina	22,221
Mercedario		
Huascarán	Peru	22,205
Llullaillaco	Chile	22,057
Volcano		
Tupungato	Chile-Argentina	21,489
Sajama Volcano	Bolivia	21,391
Illampu	Bolivia	21,276
Vilcanota	Peru	20,664
Chimborazo	Ecuador	20,561
Mt. McKinley	Alaska	20,320

block of high elevation standing between two areas of low elevation, the high land area

forms a block mountain. Block mountains are usually steep-sided. The *Vosges* in France and the *Black Forest* mountains in W. Germany are mountains of this type.

Volcanic Mountains form as a result of volcanic eruptions. When a volcano erupts, the materials that are ejected fall around a hole or crater and build up a mountain that is roughly conical in shape and has a crater at the top. *Fujiyama* in Japan, *Vesuvius* in Italy and the *Chimborazo* and *Cotopaxi* in the Andes (S. America) are examples of such mountains.

Residual Mountains: Some mountains are so deeply dissected and reduced by weathering and river action that they stand out as skeletons. The *Catskill* mountains of New York are typical of this class.

Great Deserts

Name	Country	Area in sq. miles
Sahara	N. Africa	3,500,000
Libyan	N. Africa	650,000
Australian	Australia	600,000
Great Victoria	Australia	125,000
Syrian	Arabia	125,000
Arabian	Arabia	50,000
Gobi	Mongolia	400,000
Rub'al Khali	Arabia	250,000
Kalahari	Botswana	200,000
Great Sandy	Australia	160,000
Takla Makan	China	125,000
Arunta	Australia	120,000
Kara Kum	S.W. Turkistan	105,000
Nubian	N. Africa	100,000
Thar	N.W. India	100,000
Kizil Kum	Central Turkistan	90,000

27. ISLANDS

Islands comprise a large mass of land, the biggest 16 of them accounting for as much as 22 million sq. miles – greater than the area of the continent of Europe. The smaller islands count by the thousands. Islands are broadly divided into three types, continental, oceanic and coral.

Continental Islands are those islands that rise from the continental shelf, like the British Isles or Newfoundland. These islands have the same geological structure, as the continents to which they are related. **Oceanic Islands** are those that rise from the bosom of the oceans. Their geological structure will have no relation to that of the nearest shores. They are very often the tops of submarine mountains or submarine volcanoes. *Ascension* and *Tristan da Cunha*, for example, rise from the Central Atlantic ridge (mountain) while *St. Helena* and *Teneriffe* are islands formed by submarine volcanoes.

Coral Islands are the work of minute sea organisms called coral polyps. They congregate in large colonies. When the organisms die, their skeletons, which are made of a substance resembling limestone, form big clusters, some of which rise above the water.

Coral organisms are of many types and coral formations assume many strange shapes. Some colonies spread out like fans, others grow into umbrella-like discs or

plates, while many develop spiky horns. Their colours are also as varied as their shapes. Most corals are of different pastel hues, such as lavender, soft blue, green or violet. Coral retains its fascinating colours when the colony is alive. When the colony dies, the colours fade gradually, and totally disappear where the coral is exposed to the heat of the Sun.

The gem varieties of coral which have been found in red, pink, gold or black colours do not bleach or change colour when exposed to the sun (see *Gemstones*, Part II).

Reef Corals. One type of coral excels in building reefs. Reef-building corals thrive in warm tropical seas. They usually start building reefs, along the edges of islands. Such reefs are called *fringing reefs*. Many tropical islands have such fringes. These protect the islands from the ravages of the sea. Sometimes an island, with a coral fringe begins to sink. Its shoreline goes down first, while coral building continues upwards. The

sea invades the sinking shoreline and separates the coral reef from the rest of the island. Such a reef is called a *barrier reef*. The *Great Barrier Reef*, which extends for more than 1200 miles parallel with the coast of Queensland, Australia, appears to have come into existence in this manner. This is the biggest coral reef known and consists almost entirely of the limestone skeletons of countless coral colonies that had existed through thousands of years. (see *Superlatives Part II*)

Atolls. Low circular coral islands, each with a central lagoon of shallow water, are called atolls. Atolls probably represent the late stage in the evolution of a coral island. When the island around which coral builds sinks, the coral ring remains above water, while the island disappears under the water. In course of time the coral limestone reef is weathered down to soil and seeds carried by birds or winds begin to sprout and produce vegetation. Then the coral reef turns into an inhabitable area—a *coral island* in fact.

Atolls consist of two parts, a central lagoon (watery area) and a surrounding reefland. Sometimes the watery surface is much bigger than the land surface. This is the case with *Kwajelin* in Marshall Islands, Central Pacific, where the water area covers 1100 sq. miles while the land area is a narrow ring, with a total length of 176 miles. On the other hand, *Christmas Island* in Line Islands, Central Pacific, is an atoll with the largest

World's Largest Islands

Name	Area sq. miles	Location
Greenland	840000	Arctic Ocean
New Guinea	317000	West Pacific
Borneo	287400	Indian Ocean
Malagasy Rep.	227800	Indian Ocean
Baffin Island	183810	Arctic Ocean
Sumatra	182860	Indian Ocean
Honshu	88019	N.W. Pacific
Great Britain	84186	North Atlantic
Elesmere Island	82119	Arctic Ocean
Victoria Island	81930	Arctic Ocean
Celebes	72987	Indian Ocean
South Island, N.Z.	58093	S.W. Pacific
Java	48763	Indian Ocean
Luzon	46636	West Pacific
North Island, N.Z.	44281	S.W. Pacific
Newfoundland	42734	North Atlantic
Cuba	41634	Caribbean Sea
Iceland	39698	North Atlantic
Mindanao	39191	West Pacific
Ireland (N. Ireland)		
Rep. of Ireland)	31839	North Atlantic
Hokkaido	30007	N.W. Pacific
Hispaniola (Dom. Rep. & Haiti)	29530	Caribbean Sea
Sakhalin	28597	N.W. Pacific
Tasmania	26215	S.W. Pacific
Sri Lanka	25332	Indian Ocean

land area known—184 sq. miles. Its lagoon or water surface is relatively insignificant.

28. HYDROSPHERE

It is estimated that the hydrosphere contains about 1,460,000,000 cubic km of water. Of this 97.3% is in the oceans and inland seas. The rest 2.7% is found as glaciers and ice caps, fresh water lakes, rivers and underground water.

The total stock of ocean water and fresh water has been fairly constant throughout geological history. But the ratio between ocean water and fresh water has always changed according to climatic conditions. When the climate is very cold much of the sea water is absorbed by glaciers and ice caps and fresh water increases at the

expense of sea water. When the climate grows hot glaciers and ice caps melt and sea water gains at the cost of fresh water. "Sea level observations during the last 60 to 80 years indicate that the sea level is rising slowly."† This means that the climate is becoming hotter.

† Science Reporter

Fresh Water Resources

Source	Area (km ²) × 10 ³	Volume (km ³) × 10 ³	Percentage of total
Total fresh water	147900	38982	2.67
Polar ice glaciers	15100	29784	2.04
Ground water			
800m-4000 m deep	130900	4964	0.34
Less than 800 m deep	130900	3842	0.27
Lakes	830	131.4	0.009
Soil moisture	130900	73	0.005
Atmospheric vapour	510100	14.6	0.001
Rivers	-	1.5	0.0001

Source: Science reporter.

Oceanic Water. The oceans cover 70.8% of the Earth's total surface area and hold 1445 million cubic km of water. The water despite its abundance is not directly useful to man, because it is not potable.

The ocean water contains about 3.5 per cent of dissolved salts - chlorine, sodium, magnesium, sulphur, calcium, potassium, bromine, strontium and boron. Minute quantities of carbon, silicon, aluminium, flourine and iodine are also found. The oceanic waters are always in motion, owing to a variety of natural forces.

Tides are caused by the gravitational pulls of the Sun and the Moon. The Sun's influence on the tides is less than half that of the Moon, because the Sun is so far away. All the same, the Sun countervails and supports the Moon's pull alternately. When the Sun, Moon and Earth are in a line as at new and full moon, the Sun and Moon combine their powers and we have very high tides called *spring tides*. When the Sun and the Moon are at right angles, as in the Moon's first and third quarters, the Sun acts as a counter-balancing force and reduces the Moon's pull. During these periods, we experience very low tides called *neap tides*.

Coriolis Effect. Solar heat sets ocean water moving. The Sun warms up the water in the equatorial regions causing it to expand and rise by a few inches. This extra rise in

the equator causes the water to flow down, to the north and south poles. As the warm water of the Equator flows north and south, the heavier cold water (heavier, because of its extreme condensation) in the polar areas sinks below the warm water and spreads slowly along the bottom to the equatorial regions.

This interflow is complicated by the force of the rotation of the Earth. Because the Earth spins eastwards, the sea water tends to roll up to the west, turning slightly to the right in the northern hemisphere, and to the left in the southern hemisphere. This is known as the *Coriolis Effect*, after the French mathematician, who discovered it nearly a century ago.

Then there is the force of winds. The trade winds, which form a regular feature of the tropical regions, below diagonally towards the Equator from the east in both hemispheres and then turn about and blow eastwards. Thus they keep pushing the ocean waters from the east to the west and then circling them back. This causes the huge *oceanic eddies* of whirling waters on the surface of the ocean.

Ocean Currents. The surface currents of the oceans are known as ocean currents. They not only help navigation but also influence the climate of the adjoining lands and determine fishing grounds. (1) The *Gulf Stream* is the earliest ocean current to be noticed and charted. It flows from the Gulf of Mexico into the Atlantic ocean, as a warm and swift current. It follows the American east coast up to Newfoundland. The icy *Labrador current* from the Arctic joins the warm Gulf Stream near Newfoundland. The warm Gulf Stream melts down thousands of icebergs carried by the Labrador current. This causes billowing banks of fog. Half way to Europe, the Gulf Stream splits into two branches. (2) *Kuroshio Current*. This current skirts Taiwan and the islands of Japan, goes along the coasts of British Columbia Washington and Oregon. It is a warm but slow drifting current. (3) *Humboldt Current*. This is a cold current that runs along the west coast of America. This current carries with it, plenty of fishfeed and nourishes one of the richest populations of marine life in the world.

Recent researches in oceanography have revealed powerful under-currents in the sea. *Cromwell current*, discovered in 1951, is a fast under-current in the Pacific. It is about 3500 miles long and almost as fast as the Gulf Stream. In 1957-58, a joint British-American oceanic team discovered a great current under the Gulf Stream, between a depth of 6000 and 10,000 ft, which was flowing in the opposite direction to the Gulf Stream. These deep under-currents are still being investigated.

Tidal Waves. Tidal waves are a misnomer because these waves have little to do with tides. They are caused by extratidal forces, mainly by submarine volcanoes and earthquakes and sometimes by hurricanes or cyclones. The Japanese call them *Tsunami*.

They flash through the open seas at the fantastic speed of 400 miles or more per hour. The waves follow one another in a stream with an interval of some 15 minutes between them. They appear so low and harmless in the open seas that they often deceive the sailors. When the waves are near the shore, however, they rise up to 40-50 ft and even to 100 ft in bays and inlets, battering down trees and houses in a few minutes. These waves travel very long distances and cause untold misery and loss, far away from their original starting points. The wave that hit Japan in 1960 was started by earthquakes off the coast of Chile.

The Oceans. The oceans, unlike the continents, merge so naturally into one another that it is hard to demarcate them. Nevertheless, geographers have divided the oceanic area into 4 oceans, namely the *Pacific*, the *Atlantic*, the *Indian* and the *Arctic*. These oceans, by definition, include the seas, bays, gulfs and other ocean inlets attached to them.

The *Pacific* ocean is the largest and the oldest of the oceans. It occupies 35.25 per cent of the world area. It is 10492 miles at its broadest and 37,782 feet at its deepest (Mindanao Deep). It has the greatest conglomeration of islands, which fall into three broad groups. *Micronesia*, *Melanesia* and *Polynesia*.

The *Atlantiac* ocean, the second largest ocean, covers 20.9 per cent of the world

area. Its greatest depth is 27,498 feet (Milwaukee Deep).

The *Indian* ocean, the third largest, stretches from Cape Comorin in India to the Antarctic at the South Pole. It takes up 14.65 per cent of the Earth's total surface area. Its greatest depth is 25,344 feet (Planet Deep).

The *Arctic* is strictly not an ocean. It is not navigable. It winds round the North Pole and is completely frozen in winter and covered with drifting ice for the rest of the year. However, its separate existence and its area of over 5 million sq. miles entitle it to be called an ocean.

Seven Seas. We have got only four oceans but seven seas. The proverbial seven seas are made up by dividing the first three oceans into north and south along the Equator and adding Arctic to them, thus: North Pacific, South Pacific, North Atlantic, South Atlantic, North Indian, South Indian and Arctic.

The following table shows that the areas of the oceans, with their seas and other inlets detached.

Oceans

Name	Area (sq. miles)
Pacific	63,800,000
Atlantic	31,800,000
Indian	28,400,000
Arctic	5,400,000

Principal Seas

South China Sea	3,144,000
Caribbean Sea	1,063,000
Mediterranean Sea	966,750
Bering Sea	875,750
Gulf of Mexico	595,750
Sea of Okhotsk	589,800
East China Sea	482,300
Hudson Bay	475,800
Sea of Japan	389,000
Andaman Sea	308,000
North Sea	222,125
Black Sea	178,375
Red Sea	169,000
Baltic Sea	163,000
Persian Gulf	92,200
Gulf of St. Lawrence	91,800

Ocean Floor. It was once thought that the sea bottom was flat and featureless. Recent researches in oceanography have revealed amazing topographical features in the ocean bed. The sea basins, some two and a half miles down are furrowed with terraces ribbed with mountain ranges and pitted with deep trenches.

The ocean floor may be subdivided into 3 broad groups: i. the Continental Terrace, ii. Abyssal Plains and iii. Ocean Trenches. The ocean floor slopes down from the Continental Shelf to the deep sea plains. *The Continental Shelf* is the sea floor closest to the shore. The shelf slopes down to a depth of around 200 m. The average width of the continental shelf may be between 65 and 75 km but in some places the width may be as much as 800 miles. The total area of the continental shelf is big, as big as that of Europe and S. America put together, that is to say, around 10 million sq. miles.

Beyond the shelf is the *Continental Slope* which generally reaches a depth of 1500 m but may go down to 2500 m in some places. It occupies a comparatively narrow strip of the sea-bed with an average slope of 4.3 degrees. The next portion which is really a part of the Slope is called the *Continental Rise*. This has a fairly wide extent of 1500 to 3000 m sometimes going up to 4000 m. Both the Slope and the Rise are covered up with sedimentary matter which has floated down

from the continent and its shelf. But the Slope is only partly covered with sediments while the Rise is almost wholly covered with it. These three different parts – Continental Shelf, Slope and Rise – are often clubbed together as the *Continental Terrace*.

Beyond the Continental Terrace lie the deep sea plains called *Abyssal Plain* which may average a depth of some 4000 m going down in some areas to as much as 6000 m. According to one estimate, the Continental Shelf forms about 9 per cent, the Continental Slope (including the Continental Rise) about 12 per cent and the Abyssal Plains about 79 per cent of the sea floor.

Ocean Trenches. The Ocean Trenches are long narrow trench-like depressions many thousands of feet deep. The deepest portions of the Trenches are called *Ocean deeps*.

With the advent of plate tectonics, ocean trenches have acquired new significance. It is only now that we realise the great role played by ocean trenches in the formation and renewal of the earth's crust. Almost all ocean trenches known, form what are called *subduction zones*. Subduction zones are seats of incessant geological activity. Here, the old crust plates are being steadily destroyed, thus making way for the growth of new crust. Mountain building, earthquakes and volcanoes and other activities are also associated with subduction zones.

29. RIVERS, LAKES & FALLS

The two longest rivers in the world are the Amazon (Amazonas) flowing into the South Atlantic and the Nile (Bahr-el-Nil) flowing into the Mediterranean. Which is the longer is more a matter of definition than simple measurement.

The length of the Amazon as measured in 1969 is 4007 miles (6448 km). A subsequent calculation has placed it at 4195 miles (6750 km). The length of the Nile as measured by M. Devroey of Belgium is 4145 miles (6670 km). If we take the lower figure for Amazon (4007 miles) the Nile leads by 38 miles. If the higher length is considered (4195 miles) the Amazon leads the Nile by 50 miles.

The Biggest River. However, in

judging rivers, the primary criteria are the amount of water they carry and the extent of the area they serve whether for navigation or cultivation. On these counts the Nile loses to the Amazon by wide margins. The Amazon has the longest stretch of navigable water, 2300 miles. It has the greatest flow of all rivers in the world with an average 4,200,000 cubic feet of water per second (cusecs) rising up to 7,000,000 cusecs in flood. It has

the largest river basin in the world, 2,720,000 sq. miles. It has some 15,000 tributaries, the longest tributary Medeira having a length of 2000 miles.

Longest Rivers

Name	Country/ Continent	Length in miles
Amazon	S. America	4007/4198
Nile	Africa	4148
Mississippi-Missouri	USA	3710
Yangtze	China	3400
Ob-Irtysh	USSR	3200
Congo	Africa	2900
Amur	Asia	2704
Hwang (Yellow)	China	2700
Lena	USSR	2648
Mackenzie	Canada	2635
Mekong	Asia	2600
Niger	Africa	2600
Parana	S. America	2450
Yenisey	USSR	2364
Murray-Darling	Australia	2310
Volga	USSR	2290
Maderia	S. America	2000
Yukon	Alaska-Canada	1979
St. Lawrence	Canada-USA	1900
Rio Grande	USA-Mexico	1885
Purus	S. America	1850
Sao Francisco	S. America	1800
Salween	Asia	1750
Danube	Europe	1725
Euphrates	Asia	1700
Indus	Asia	1700
Tocantins	S. America	1700
Brahmaputra	Asia	1680
Syr-Darya	USSR	1680
Si	China	1650
Ganga	India	1650
Orinoco	S. America	1600
Nelson	Canada	1600
Zambezi	Africa	1600
Ural	USSR	1574
Amu-Dar'ya	USSR	1550
Olenek	USSR	1500
Paraguay	S. America	1500
Japura	S. America	1500
Arkansas	USA	1450
Colorado	USA-Mexico	1450
Dnieper	USSR	1418
Rio Negro	S. America	1400
Orange	Africa	1350

Kolyma	USSR	1335
Irrawaddy	Burma	1325
Ohio	USA	1306
Kama	USSR	1262
Don	USSR	1222
Columbia	USA-Canada	1214
Saskatchewan	Canada	1205
Peace	Canada	1195
Darling	Australia	1160
Angara	USSR	1157
Tigris	Asia	1150
Sungari	Asia	1130
Pechora	USSR	1111
Snake	USA	1038
Red Taxas	USA	1018
Churchill	Canada	1000
Pilcomayo	S. America	1000
Uruguay	S. America	1000
Magdalena	Colombia	1000

Principal Lakes & Inland Seas

Name	Location	Salt or fresh	Area in sq. miles
Caspian Sea	USSR & Iran	Salt	143550
Lake Superior	US & Canada	Fresh	31820
Victoria Nyanza	Uganda, Kenya, Tanzania	Fresh	26828
Sea of Aral	USSR	Salt	25300
Lake Huron	Canada & US	Fresh	23010
Michigan	US	"	22400
Tanganyika	Zaire, Zambia4 Tanzania	"	12700
Great Bear	Canada	"	12275
Baikal	USSR	"	11780
Nyasa	Tanzania, Malawi & Mozambique	"	11430
Great Slave	Canada	"	10980
Erie	Canada & US	9930	
Winnipeg	Canada	"	9464
Ontario	Canada & US	"	7520
Ladoga	USSR	Fresh	6835
Chad	Niger, Nigeria, Chad & Cameroon	"	6300
Onega	USSR	"	†3710
Eyre	Australia	"	†3700
Titicaca	Peru & Bolivia	"	3200

† The area is highly variable according to seasons
The figure given is the average area

Athbaska	Canada	"	3120	King George VI	Guyana	1600
Nicaragua	Nicaragua	"	3089	Upper Yosemite	USA	1430
Rudolf	Kenya &			Tugela	S. Africa	1350
	Ethiopia	"	2475	Gavarnie	France	1385
Reindeer	Canada	"	2465	Wollomombi	Australia	1100
Issyk Kul	USSR	"	2355	Takakkaw	Canada	1000
Torrens	Australia	"	2230			
Vanern	Sweden	"	2149			
Winnipegosis	Canada	"	2105			
Albert	Uganda &					
	Zaire	"	2075			
Kariba	Zimbabwe &					
	Zambia	"	2050			

Famous Waterfalls

Name	Country	Height (ft.)
By Height		
Angel	Venezuela	2648
Kukenaam	Venezuela	2000
Ribbon	USA	1612

By volume of water			Average annual flow (cu. ft. sec.)
Guaria	Brazil		470000
Khon	Indo-China		410000
Niagara	Canada		212200
Paulo Afonso	Brazil		100000
Urubupunga	Brazil		97000
Iguazu	Argentina		61660
Patos-			
Maribondo	Brazil		53000
Victoria	Zimbabwe		38430
Grand	Labrador		35000
Kaieteur	Guyana		23400

30. ATMOSPHERE

The atmosphere is an insulating blanket protecting the Earth. It softens the intense light and heat of the Sun. Its Ozonic (O³) layer absorbs the most deleterious wave lengths of the Sun's ultraviolet rays and thus protects living organisms from extinction.

The atmosphere is bound to the Earth by gravity. Satellites like the Moon, which have very low gravitational power, cannot and do not hold an atmosphere.

Air pressure simply means the weight of the entire air column over a given point. Air, of course, has very little weight. A cubic foot of air weighs around an ounce and a quarter. At the sea level, the air pressure is 14.7 pounds to the sq. inch. This pressure is usually described as *one atmosphere*.

Composition. The atmosphere is composed of various gases and water vapour, and in its uppermost reaches, it is charged with subatomic particles. Up to about 30 miles from the Earth, the atmosphere consists of about 78 per cent nitrogen, 21 per cent oxygen (O₂) and minor percentages of argon, carbon dioxide, neon, helium and methane, in that order. Above 30 miles, the atmosphere is made up of atomic oxygen (O₁),

ozone, (O₃), helium and hydrogen.

The presence of atomic hydrogen in the upper atmosphere has recently been confirmed by a camera left on the surface of the Moon by the Apollo-16 mission. The camera has revealed a cloud of atomic hydrogen extending outwards from the Earth to about 64000 km.†

Water vapour is present in the lower atmosphere, say up to 7 miles, in concentrations ranging from 0.01 per cent to 1 per cent. Although the amount of water vapour in the atmosphere is very small, its importance is very great, for without water in the atmos-

† Some astronomers think that the Sun's ultraviolet rays break up the water molecules in the upper atmosphere into hydrogen and oxygen atoms. The lighter hydrogen atoms stay up and the heavier oxygen atoms descend to the lower atmosphere, replenishing the oxygen supply of the Earth. Thus a major part of the oxygen supply of the Earth could have been contributed by the solar ultraviolet radiation, and not by photo synthesis as believed earlier (see *Biosphere* infra).

phere, there would be no weather on Earth. Water enters the atmosphere by evaporation from the hydrosphere (and also by transpiration of plants) and leaves the atmosphere by precipitation as snow or rain. It is a never-ending two-way traffic.

Clouds are made of water vapour that has evaporated from the Earth. They are very tiny droplets of microscopic size and are too light to fall down as rain. So they ride on the air waves until they are condensed and then fall down as rain. Clouds are classified according to their shapes. *Cirrus* clouds are shaped like ringlets and go up to 40,000 ft. in height. *Cumulus* clouds are those that rise in heaps, and *Stratus* are those that are scattered about. *Nimbus* clouds are the menacing rainstorm clouds. The various types are often found mixed together like the *Cirrocumulus*, *cirro-stratus*, *cumulo-nimbus*, etc.

Cumulo-nimbus clouds are the homes of thunder and lightning. The top of these clouds has a positive charge while the middle and lower portions are, for the most part, negatively charged. The Earth below is mainly positive. The negative layer caught between two positive layers – the Earth and the cloud top – is always restive. Here lightning flickers intermittently, lighting up the cloud from within. Every now and then streaks of lightning break through the clouds and strain towards the Earth.

Lightning. It is the surge of electricity from the Earth that makes the lightning the awesome phenomenon that it is. The lead, however, is taken by the clouds which send down a rather weak stroke called the leader stroke. The Earth responds by sending up a much more massive stroke to the clouds. The whole thing takes less than a second, so that we see the leader stroke and the counter stroke as one flash of lightning.

Dry air is highly resistant to electricity. When the air is loaded with water vapour it becomes an easier conductor. Nevertheless, much power is required for the stroke to rip through the air. This excessive discharge of electricity heats up the air around the passage (of the stroke) to incandescent temperatures, say 10,000°C. It is this glowing air that we see as lightning flash. The heat also causes a sudden expansion of air which,

as the heat disappears, contracts quickly again. This sudden expansion and contraction produce the familiar thunder clap. Although both occur at the same time, we see the flash first because light travels much faster than sound.

It has been estimated that at any time, an average of about 1800 thunder storms take place over the globe. Lightning flashes are, of course, numberless.

Three Layers. The character and composition of the atmosphere change as we go higher and higher. Altitudinally arranged, there are 4 important spheres, with 3 pauses. They are: 1. Troposphere with Tropopause, 2. Stratosphere with Stratopause, 3. Mesosphere with Mesopause and 4. Ionosphere or Thermosphere.

The *Magnetosphere* which lies beyond the Exosphere along with *Magnetopause* which marks the outer boundary of the Magnetosphere, does not form part of the atmosphere. It represents the outermost limits of the Earth.

Troposphere is the lowest gaseous layer of the atmosphere and extends to a height of about 7 miles from the Earth. The troposphere contains nearly two-thirds of the total mass of the atmosphere. It is the region of weather and clouds. Here, the air thins out with increasing altitude and temperatures drop at an average of 2°C for every 1,000 feet. The familiar saying 'the higher we go, the cooler it is' applies to this region.

Tropopause is the layer that joins troposphere, the lowest layer, with the upper layer Stratosphere. The height of tropopause varies with latitude. It is the highest at the Equator, where it is located at 18 km above the Earth. At the poles, it is about 6 km above the Earth. In India, the tropopause is generally at a height of around 16 km.

In the tropopause, temperature levels out at the lowest point reached in the troposphere. The tops of cumulus-nimbus clouds often float in this region.

Stratosphere is the region above tropopause. It is about 20 miles thick. It is free from the violent weather changes which occur below. So, it is preferred by our jet liners. Jet liners, however, face another meance in stratosphere, namely Jet Streams.

Jet Streams are high velocity air currents. (See *Jet streams* below). Apart from the danger posed by their high speeds, they give rise to violent overturning of air currents. This overturning is known as CAT (*Clear Air Turbulence*). CAT strikes without warning. It may destroy both the aircraft and the passengers.

In the stratosphere, temperature has a tendency to rise. This is due to the presence of ozone. The air here is highly rarefied and there are only 8 ozone molecules to a million. But this is sufficient to keep the temperature rising.

Ozone Layer absorbs ultraviolet radiation from the sun and converts it into heat and chemical energy. It is this activity that is responsible for the rise in temperature. This layer is not of uniform thickness. Its profile is shaped like that of the Earth, being highest at the equator and lowest at the poles. The ozone layer is quite thin – about one-eighth of an inch thick, that is, if it were subjected to the pressure prevailing in the troposphere.

The amount of ozone on the Earth is only a fraction of the quantity in the stratosphere. This is a blessing, because any concentration of ozone beyond certain levels is injurious to life, to both plants and animals.

Mesosphere is a relatively quiet region where few energy releasing reactions occur.

Mesopause, a thin layer of extremely cold

atmosphere, separates the Mesosphere from the Ionosphere above.

Ionosphere is also known as Thermosphere because of the high temperatures prevailing there – as much as 870°C over the Equator and 1427°C over the North Pole. Almost all the atoms in this region are ionised, that is, their electrons are stripped off by the Sun. Large numbers of free electrons flash about in this area. This makes this layer of atmosphere a conductor. The electric waves entering this region are reflected or refracted back to the Earth. This reflection enables radio waves to bend and pass round the Earth. So, radio waves reaching this layer can be guided around the globe in such a way as to permit them to be utilised in long distance communication.

This is also supposed to be the region where polar auroras occur and where most of the meteors burn themselves out.

Magnetosphere is the Earth's magnetic belt, where streams of spiralling protons and electrons, pouring out from the sun, are trapped by the Earth. This magnetic field extends to about 40,000 miles or some 64,000 km above the Earth. (See also *The Sun*.)

Magnetopause is the outer boundary of the magnetosphere. Here, the charged particles of the Sun take over completely, overriding the feeble magnetism of the Earth. Magnetopause thus forms the final boundary between the Earth and Outer Space.

31. WIND BELTS

Wind belts are formed by streams of air moving over the surface of the globe. These movements are caused by differences in atmospheric pressures, which are themselves caused by differences in temperature.

It is well known that the density of gases increases inversely to their temperature. The hotter the gas the lighter its density, the colder the gas the higher the density. Hot air moves up and cold air sinks down. Thus where the air is warm and ascending low pressure systems are created and where it is cold and descending high pressure areas come into being.

Air flows from high pressure to low pressure regions, much as water flows from

high altitudes to low. But such a straight flow of air is prevented by the rotation of the Earth. As the Earth spins west to east, air motions are deflected and assume rather rotatory patterns.

In the northern hemisphere, air circles low pressure systems in a counter-clockwise rotation. It is the other way round in high pressure systems. The rotation of air in low pressure systems is called *cyclonic* and that around high pressure areas, *anticyclonic*.

Cyclonic and *anticyclonic* winds rotate in opposite directions.

Jet Streams according to the World Meteorological Organisation, are winds, thousands of miles long, more than 100 miles wide and a few miles deep, with a minimum speed of 100 feet per second.

Jet streams originate from the differential temperatures of the Polar air and Tropical air. Where these two systems of air meet, their differing temperatures produce corresponding pressure changes. These pressure changes set the Jets in motion. There is always a sizable difference between polar and tropical temperatures. In summer, the difference is lowest – polar air 32°F and tropical air 85°F. In winter, the difference reaches its maximum – minus 40°F in the arctic and 85°F in the tropics. (Tropical air is more or less constant in temperature).

It is the extent of horizontal temperature contrast between the warm tropical air and the cold polar air that determines the wind speeds of Jet Streams and the latitude belts over which they flow. When the difference is the lowest, the wind speed remains at the minimum and the latitudinal area shifts towards the poles. When the difference is very high, wind speeds increase and the Jets edge towards the equator.

Thus, the Polar-front Jet turns towards the pole and passes over Canada in winter, but in summer, it shifts further south and crosses over US. Similarly, the Subtropical Jet which passes over the northern boundary of US in winter, moves south to cross the US-Mexican border in summer. The southward shifts of these westerly Jets occur around the whole northern hemisphere and leave no room for the Tropical Easterly Jet to develop over India and Africa.

Temperature Changes. Between 1880 and 1940, the Polar temperature appears to have increased. There was a general warming tendency in the northern hemisphere. The result was that the Jets moved further north and also became weaker. Since 1940 arctic temperature has fallen by a little less than 1°C. This is a very small drop but it is sufficient to affect the strength and direction of Jets. With Polar temperature dropping and Tropical

temperature remaining constant, the Jets move further south and become feebler.

These changes affect agricultural operations, as a whole, in the entire belt. The worst sufferings come to areas of marginal rainfall. Any shift or weakening of the Tropical Jet would mean that these marginal areas receive less than their normal rainfall. Their normal rainfall itself being scanty, any further reduction will only mean drought and disaster. This was what happened in the sub-Sahara region (around Sahel) in Africa which was hit by a severe drought in 1972 and 1973.

These changes mean trouble for India too. The Tropical Jet, weakened as it is, will not be able to hold its own against the invading Polar Jet. This may delay the onset of the monsoon as well as hasten its retreat, thus cutting short the cropping season. The intermittent droughts, caused by the Polar Jet during the rainy seasons, are also likely to pull down agricultural production.

Regulators of Weather. The Jet Streams are important in many ways. (i) They are the over-all regulators of weather conditions on Earth. These fast and colossal streams draw up large masses of air, as they accelerate. This produces low pressure areas on the surface of the Earth. Low pressure systems lead to what is called cyclonic weather conditions – clouds, rains and foul weather generally.

In the same way, as the Jets decelerate, they send down huge masses of air into the lower troposphere and create high pressure systems. High pressure systems entail anti-cyclonic weather, namely fine dry weather. (ii) The vertical air motions induced by Jet Streams – ascending air in cyclones and descending air in anti-cyclones – cause rapid and incessant churning and mixing of air between the troposphere and stratosphere.

This mixing is beneficial in two ways: (a) It maintains the chemical composition of the atmosphere, especially its oxygen and nitrogen contents, uniform over the globe. (b) It dilutes the pollutants that modern civilization throws up, by carrying them up into the stratosphere and distributing them over a much wider area. This keeps pollution within tolerable limits. (iii) They control monsoon rains over the entire tropical belt.

How it affects India. The directional changes in Jet Stream flows and the associated weather patterns are dramatically seen on the Indian subcontinent, where the scenes change radically in a few days. The Subtropical Jet moving over the subtropical high pressure areas produces anti-cyclonic weather condition on the Indian subcontinent. This is the beginning of the dry monsoon winter in India in late September. Towards the end of May, the Subtropical Jet retreats almost as suddenly it came. In a matter of days, it skips the Himalayas and moves into Tibet to join the Polar-Front Jet sweeping over Siberia and China.

The Easterly Tropical Jet now takes over and establishes itself on the Indian subcontinent and S.E. Asia. By this time, the blistering summer sun will have sucked India dry and billows of vapour from the Indian Ocean will have filled the lower troposphere. The disturbances generated by the Tropical Jet induce ascending air motions throughout the depth of the troposphere. This causes air pressure to fall and to form the familiar monsoon depressions in the Arabian Sea and the Bay of Bengal. The moisture-laden air carried aloft by the Tropical Jet forms thunder-clouds which release the heavy rains, associated with S.W. monsoon in India.

Erratic Behaviour. The Indian S.W. monsoon is proverbially erratic. It follows no fixed calendar dates. Sometimes it comes early, sometimes late. Now and then it stops suddenly and starts again. These vagaries are now explained by the erratic behaviour of the Polar Jet. This Jet, instead of staying up in Siberia and thereabouts, wanders now and then into India.

The Himalayas poses no problem to the jets. They soar high above the Himalayas. The presence of the Polar Jet over India triggers dry spells. Sometimes, these spells are prolonged enough to create drought conditions all over India. The Tropical Jet, which prevails in India, is apparently not strong enough to stave off the incoming Polar Jet. These mid-season droughts spell ruin for Indian agriculture.

Monsoon. The word monsoon is derived from the Arabic word *mausim*, meaning season. This implies that the

monsoon is a seasonal wind. India banks heavily on the monsoon for its agricultural operations. The monsoon system extends over a large area – China, Japan, S.E. Asia and India. The system has two branches, Asian and Indian. The Asian system covers China, Japan and all S.E. Asia. The Indian system is mainly confined to the Indian subcontinent, namely India, Pakistan and Bangladesh.

Two winds that blow regularly towards the equator from the north and south are called the north-east and south-east *Trade Winds*. Trade winds have nothing to do with trade, although trading vessels, especially in the days of sail, took advantage of them. The epithet *trade* is derived from the word *tread*, that is to say, from the fact these winds blow regularly along a *trodden* path-way in the atmosphere. Trade winds are dry winds that bring fine weather and low rainfall.

During summer the air in the equatorial seas is heated up by the sun. The hot air goes up leaving an area of low pressure. However, the north and south latitudes continue to be high pressure areas. From these high pressure regions called Horse Latitudes* winds blow steadily into the low pressure area. These are the trade winds which blow consistently at about 11 to 14 miles an hour.

This region where the trade winds meet is a quiet zone known as the *Doldrums*. The doldrums change position according to seasons, sometimes moving into the Horse Latitudes. So both the equatorial seas and the Horse Latitudes can be regarded as doldrums.

Westerlies are winds which blow from the tropics to the poles. They are known as South-westerly in the northern hemisphere and North-westerly in the southern hemisphere. The westerlies are, in the main, rainbearing winds and bring in a wet climate.

Tropical Storms are known by different names in different places. They are *hurricanes* (from the Caribbean word *hurrikan* meaning evil spirit) in the US and the

* The Horse Latitudes came to be so called because ships of old used to carry horses from the Old World to the New. When these ships lay becalmed in this region most of the horses died for want of food and water and were thrown into the sea.

Caribbean, *typhoon* in the Far East and *cyclones* in the Indian sub-continent. The Chinese call them *Taifu* meaning great wind, the Japanese have christened them *Akashima* meaning swift wind. The Americans name every hurricane separately. These names are all feminine, *Amy*, *Betsy*, *Clara*, *Daphna* etc.

Technically, the hurricane is a 'cyclone vortex' – a circulation of air around a core of low pressure. It spins clockwise below the equator and anti-clockwise above the equator. To be classed as a hurricane, it must have a circular speed of at least 75 miles per hour. This is the minimum speed. Maximum speeds vary from storm to storm. They may go as high as 150 to 200 miles per hour. A fully developed hurricane may cover an area of some 300 to 400 miles in diameter. They may last 1 to 30 days.

In a single day, a moderately intense hurricane may often release as much heat energy as would be released in the simultaneous detonation of 400 twenty-megaton hydrogen bombs. If converted to electricity, that amount of energy would be sufficient to supply all the electrical needs of the entire United States for more than six months. Furthermore, hurricanes release this energy, day after day, until they weaken and dissipate—that is over a period that averages a week.

Between the great Trade Winds of the north and south lie the Doldrums, a place of calm but not of peace. Here during summer, columns of moisture-laden air rise from the sea. They spiral around a hollow centre. This

marks the start of a hurricane. The distinguishing feature of a hurricane is *the eye* or the storm centre.

Hurricane Attacks. One to three hurricanes strike US annually. Betsy (1965), Camille (1969), and Agnes (1972) were some of the worst hurricanes that swept over US in recent years. In the Far East, the typhoon season begins in June, reaching its peak in September and subsiding by November. They originate east of the Philippines and usually travel towards Japan or mainland China, but their route is unpredictable.

In 1970 the Philippines experienced three typhoons one after the other. The Bay of Bengal in the Indian Ocean is another cyclone centre. Bangladesh and the eastern coasts of India are hit by cyclones, almost every year. The 1970 cyclone in Bangladesh is the worst on record in many years.

Winds not only move clouds across the skies and thus influence rainfall, but they also carry dust and sand across the continents. These are dust storms that ravage desert and semi-desert areas. Sometimes these dust storms cross the seas and deposit their material in far away continents.

One such dust storm carried North African mud to Florida in the US, in the first week of June, 1983. According to scientists, it was the largest inter-continental dust storm so far known. It carried more than a million tonnes of dust and grit. The dust clouds originated in the Sahara. They swirled up five miles above the desert and spread to a width of over 1500 miles. They were carried by the Westerlies to Florida in the US.

32. BIOSPHERE

The idea of a biosphere (sphere of life) was first suggested by the Austrian geologist Eduard Suess nearly a century ago. It was at that time an insignificant concept. Today, however, the biosphere has become the most important problem faced by man.

The distinguishing feature of the biosphere is that it supports life. It is estimated that the biosphere contains more than three hundred and fifty thousand species of plants including algae, fungi, mosses and higher forms of plants, and eleven million animal species ranging from uni-cellular protozoa to man.

The biosphere supplies the essential requisites of life for all these species, namely light, heat, water, food and living space or habitats.

The biosphere, or the *eco-system*, as it is generally called, is an evolutionary system. It represents a stable equilibrium of various physical and biological factors which have

been operating in the past. The organic continuity of the system rests on a delicate network of interdependent relationships. The air, the water, man and the animals, plants and planktons, the soil and bacteria are all invisibly interlinked in a life-sustaining system we call the environment.

Rhythm. The eco-system or the environment has a rhythm and movement of its own which depend upon a whole set of delicately balanced cycles. All living organisms – microbes, plants, animals, man – have survived by adjusting themselves to the environment and attuning their lives to its rhythm. It is, therefore, absolutely necessary that these cycles should be maintained unimpaired.

What keeps the biosphere going is solar energy which comprises 99.98 per cent of the total energy supply of the biosphere. Day in and day out the Sun pours forth its energy in the form of sunlight. Light consists of bundles of energy called *quanta*. The energy content of a quantum of light is proportional to its frequency. The shorter the wavelength, the higher the frequency and the greater the energy content, (see *Outer Space* supra).

Photosynthesis. The process by which solar energy is transferred to molecules is called photochemical process. In this process sunlight excites the electrons in a molecule and kicks them out. This releases electrons to pair with other electrons from a neighbouring atom or molecule and thus forms electron-pair bonds. These new bonds create new molecules.

The most important photochemical activity in the biosphere is photosynthesis in plants. Photosynthesis is a complicated process. The light absorbed by chlorophyll molecules and by other pigments in plants is transferred to electrons in such a way as to create strong oxidants, that is, molecules that readily remove electrons from other molecules (oxidise them), or reductants, that is, molecules that readily supply electrons to other molecules (reduce them).

It is these oxidants and reductants that assist plants in producing carbohydrates and oxygen from molecules of carbon dioxide and water. Plants respire (give out) oxygen

but retain carbohydrates which are converted to energy and stored in the form of chemical bonds, notably those of adenosine triphosphate (ATP) which is the basic energy currency of all living cells. High energy phosphate bonds of ATP contain 12000 calories and release 7500 calories when broken.

Life Process. This energy is carried up the food chain by herbivores feeding on plants and carnivores feeding on herbivores. Omnivores like man draw their energy both from plant and animal sources. Much of the energy drawn by plants and animals (including man) is consumed and spent in maintaining the process of life.

The energy that is not expended in the course of life is stored in dead matter. Decomposing bacteria break up the dead matter and convert it into *humus* or *organic sediments*, releasing carbon dioxide, water and heat into the biosphere. Thus the basic ingredients of life are returned to the soil. The plants draw their nutrients from the soil and keep the cycle going.

Heat Cycle. Heat is one of the prime requisites of life. This is supplied by solar radiation. It is calculated that the solar heat reaching the Earth's orbit (just above the atmosphere) amounts to about 2 calories per sq. centimetre per minute. But the Earth gets only less than half the radiation reaching the top of the atmosphere.

About 2 per cent is absorbed by the ozone layer in the atmosphere. Atmospheric water vapour, carbon dioxide and dust particles absorb around 18 per cent. The clouds reflect back into space some 23 per cent. About 22 per cent is scattered by the atmospheric dust. The Earth receives only the balance of 38 per cent. But the story does not end there. Out of the 38 per cent solar radiation received, the Earth re-radiates about 7 per cent by long wave radiation, thus reducing the stock of terrestrial energy to 31 per cent.

At the same time, out of the 22 per cent scattered by the atmosphere, 16 per cent ultimately reaches the Earth as *diffuse radiation*, the rest 6 per cent being irretrievably lost in space. Thus, on the whole, the Earth receives about 47 per cent of the solar

energy reaching the atmosphere. Meanwhile, the atmosphere acting as an intermediary between the Sun and the surface of Earth, retains about 5 per cent of the energy as sensible heat and about 24 per cent as latent heat in water vapour.

It is essential that the absorption and re-radiation of heat should ultimately balance. Otherwise the Earth would experience a net increase in heat or a net decrease according as a surplus or deficit of heat results from radiation. The balance between absorption and re-radiation is mainly regulated by water vapour in the atmosphere.

There is only a very little amount of water in the atmosphere, about 0.001 per cent. This insignificant amount of atmospheric water exercises an influence on the climate of the Earth, out of all proportion to its total mass. Besides, keeping the balance between the absorption and radiation of heat, it controls the water cycle and determines our climatic conditions.

Carbon Cycle. The biosphere contains a complex mixture of carbon compounds, in a continuous state of creation, transformation and decomposition. Practically all organic matter originates in the process of photosynthesis. The plants use the radiant energy of the sun to convert carbon dioxide and water into carbohydrates by splitting water to derive hydrogen, and by drawing in carbon dioxide from the air. In the process the plants release free oxygen (O_2) into the atmosphere. While plants absorb carbon dioxide during photosynthesis, all living organisms respire and release carbon dioxide and decomposing bacteria do the same in regard to dead matter. But while respiration and decomposition go on all the time, photosynthesis takes place only during daytime. During daytime, carbon dioxide in the atmosphere comes down from an average of 320 parts per million to around 305 parts but at night it increases, going up to as much as 400 parts per million, near the ground level.

Apart from the daily production and consumption of carbon (in the form of carbon dioxide), the Earth has a vast stock of carbon in permanent form. This stock consists of inorganic deposits (mainly carbonates like calcium carbonate etc.) and organic fossil

deposits (chiefly coal, shale and oil). When we burn fossil fuels, we are merely adding more carbon dioxide to the atmosphere which has an excess supply already.

Oxygen Cycle. Oxygen not only supports life but also plays a fundamental role as a building block of practically all vital molecules accounting for about a fourth of all the atoms in living matter.

The most recent factor affecting the oxygen cycle of the biosphere and the oxygen budget of the Earth is man himself. He inhales oxygen and exhales carbon dioxide, thus reducing the stock of oxygen and increasing the supply of carbon dioxide. He goes further and burns fossil fuels, depleting the oxygen supply still further. He reduces photosynthetic activity, by cutting down forests and replacing them with cities.

Some astronomers think that the original supply of oxygen in the atmosphere came from the ultraviolet rays of the Sun which broke up the water molecules in the upper atmosphere into hydrogen and oxygen (see *Atmosphere* supra). Whatever may be the initial source of the oxygen in the atmosphere, what is important is that the plants are now augmenting the oxygen supply by photosynthesis. They are not only augmenting our oxygen supply but also reducing the total supply of carbon dioxide which is increasing to alarming dimensions.

Nitrogen Cycle. Nitrogen as it obtains in the atmosphere cannot be used by the higher organisms. It has to be "fixed", that is, incorporated into a chemical compound. Nitrogen, in other words, has to be converted into *ammonia* or *amino acids*, so as to be of use to plants and animals.

Fixation of atmospheric nitrogen on land is carried out by organisms called diazotrophs who possess the genetic code for the synthesis of enzyme nitrogenase which catalyses nitrogen fixation. These organisms fall into two broad classes – symbiotic and non-symbiotic. Symbiotic diazotrophs operate in association with some species of plants like legumes. They contribute the lion's share (83%) of nitrogen fixation on land. Non-symbiotic agents who contribute the rest (17%) include blue green algae, and

aerobic (those requiring oxygen) bacteria and anaerobic (those who do not require oxygen) bacteria.

The total annual nitrogen required by the biosphere is estimated to be 1050 million metric tonnes (mmt). Of these the diazotrophs account for only 140 mmt. Non-biological agents like lightning or fire contribute 40 mmt. The balance of 870 mmt. comes from nitrogen locked up in dead plants and animals. These are recycled by nature as nitrates. The nitrates are converted into amino acids by decomposing bacteria. In aerobic conditions, where oxygen is available, bacteria will again intervene to oxidise the amino acids into carbon dioxide, water and ammonia. Thus nitrogen in the form of ammonia is returned to the atmosphere where it gets dissolved in rain water, and ultimately replenishes the Earth.

Man has interfered with this natural cycle by industrially fixing nitrogen. He is now converting nitrogen into assimilable forms by artificial methods. Production of nitrogenous fertilisers has increased phenomenally in the last few decades. This means that there is an extra input of nitrogen into the atmosphere. This extra input is already larger than the natural output. We cannot now say how far this extra input will affect the biosphere or in what direction.

Water Cycle. Water plays a versatile role in the functioning of the biosphere. It is essential to all forms of life, plants, animals and man. The water cycle has two distinct branches – the atmospheric branch and the terrestrial branch. In the atmosphere, water exists mainly in gaseous form. On the Earth, liquid forms and solid forms (ice) predominate.

Water is important to the biosphere in that it is from water that the biosphere draws its most abundant element, hydrogen. Hydrogen in the form of carbohydrates constitutes a very important source of energy for all living things. Although we have a plentiful supply of water in the oceans, it is not of direct use to us.

We depend upon a small stock of water – less than 1 per cent – contained in our rivers and fresh water lakes and in the subsoil. This little stock of water is replenished by an even smaller stock of mobile water – less than 0.001 per cent – which circulates in the atmosphere as water vapour much of which ultimately falls down as rains.*

The water cycle of the biosphere depends on the reciprocity of evaporation and precipitation. Liquid water on the Earth goes into the atmosphere as vapour by evaporation and transpiration of the plants. The vapour is returned to Earth (precipitation) as rain or snow.

33. ECOLOGY

Man's meddling with nature, chemical effluents, nuclear waste, acid rain and ever increasing presence of carbon-dioxide in the atmosphere have resulted in the greatest ecological crisis known to mankind. The death of 2500 persons at Bhopal in 1984 due to inhalation of poisonous gas leaked out of an insecticide plant is the latest warning to humanity.

Ecology has been defined as the study of organisms in relation to their environment. This covers the whole world of organic life – plants including fungi, animals including microbes and man. Then, there is the environment itself, which includes not only the animate organisms that populate the biosphere but also the inanimate forces operating in nature.

Man-made Crisis: Though ecology covers all species of life, the species which

occupies the centre of the stage is man, because he, alone of all species, had set out on a confrontation with nature. His fight with the established natural systems has had a long history. But it is only in the latter half of the 20th century that it had assumed the proportions of a crisis. This is what is described as the *Ecological Crisis*.

When man gave up living on what food he found in nature and settled down to grow his

* See *Hydrosphere* supra.

own food, he began interfering with natural systems. This happened during the very dawn of history when men built the first great river valley civilizations of Sumeria, Egypt and the Indus Valley. Ever since, man has been incessantly engaged in struggles of one kind or another with natural systems.

Since the Industrial Revolution, his interference with the ecosystem had increased both in volume and in intensity. Man had by the time colonised the far corners of the Earth. Everywhere he went he had fought nature and won. In the first flush of success, he described his progress as the *Conquest of Nature*. Now he wonders who is conquering whom.

Exploitation: It is evident that man has to exploit natural systems, if he is to assure himself of better living conditions. When we clear virgin land and plant crops we are unbalancing a functioning natural system. Once we unbalance a natural system we have to maintain that imbalance in order to grow more crops in future. There is thus an ever present conflict between man's need to exploit his environment and nature's need to maintain its stability. This is inevitable. As Gordon Harrison puts it, "If man is to continue to exploit the natural systems to his own advantage, then his first prescription is to see that these systems stay around to be exploited".

"The question", says Dr. Holling, "really concerns itself with the stability of the natural systems, in the degree to which they can absorb disturbances and this is really the central question that ecologists have been facing. We do know that despite arguments for the delicate balance of nature, natural systems are profoundly resistant to change. But...this resistance is not infinite" It can and does break down under persistent attack.

In the circumstances, the sensible course for man is to stop and consider how the natural systems react to his exploitation and assess their powers of endurance and resilience before he proceeded to exploit further. But this is precisely what mankind has so far refused to do.

Interdependence: In the ecosystem all species of life, plant and animal, are inter-linked with one another. Interference with any species will have long standing

repercussions on others. We have been massively intervening in the environment without quite understanding its complications. Often enough, we realise the magnitude of the damage we have wrought long after the mischief had been done and the situation has passed beyond repair. The Dodo is a typical case (see Box.).

It is clear that the biosphere is an integrated whole and that its numerous parts are interconnected. Prof. Barry Commoner points out that these interconnections, especially along the food chain, accelerate the impact of our inroads into the environment and amplify them greatly. Commoner gives the following example. If we put one unit of insecticide per gram in the soil, the earthworms living in the soil will contain 10 to 40 units per gram and in woodcocks feeding on the earthworms, the insecticide level will rise to 200 units per gram.

Says Prof. Commoner, "In the biosphere the whole is greater than the sum of its parts....Because of such amplification, a small intrusion in one place will trigger a huge response elsewhere in the system. Often the amplification feeds on itself until the entire living system is engulfed....It is not surprising then that the introduction of any killing chemical into the environment is bound to cause a change somewhere in the tangled web of relationship".

Natural Resources: Our physical milieu, as Prof. Harold Cassidy† reminds us, "is finite, not only the surface of the Earth, but the waters of the sea and the gases in the atmosphere". Land is limited and good land scarce. There is plenty of water in the sea but it is not infinite. Anyhow, the supply of usable water is woefully short. (see *Hydrosphere* supra). Even air which is freely available everywhere may run short of the most vital gas that we need and need every moment—oxygen.

Add to this, the fact that we are recklessly exploiting all natural resources, coal, oil and minerals and we have a perfect set-up for a crisis of resources. We do not seem to be aware of any such impending crisis, judged by the way we are squandering our resources. But any moment, a shortage of one or the other may stare us in the face.

† Professor of Chemistry, Yale University

The Dodo



"The dodo", wrote the American humorist Will Cuppy, "seems to have been invented for the sole purpose of becoming extinct and that was all that he was good for." Cuppy's gibe at the poor dodo is not hyperbole. The dodo was first sighted in 1507. By 1681, barely 75 years after, it had become extinct.

The dodo is native to Mauritius, an island in the Indian Ocean. The Portuguese sailors were the first to see the bird, when they landed on the island in 1507. Dodo belongs to the pigeon family but is flightless. What we know about these birds comes from the reports of the Portuguese sailors. They were ungainly in appearance, slow and clumsy in their movements and quite fleshy. A bird weighed anything between 25 and 50 lbs.

The Portuguese sailors shot them for food. The birds were reported to be so stupid that they simply stared at the guns trained on them. This led to their quick extermination. The last bird was seen in 1681.

In recent years it was noticed that a big tree, native to Mauritius, *Calveria major*, was getting depleted in numbers. In 1973 there were only 13 calveria trees in Mauritius, all of them around 300 years old and dying.

Researches conducted by Stanley A. Temple and others of the Wisconsin University, USA, have shown that the calveria seeds depended on the dodo for germination. These trees produce big fruits but their seeds do not germinate even in nurseries, because the seed is encased in a stout epicarp, about 15 millimetres thick. The epicarp is too strong for the embryo to break through. The dodo which consumed this fruit in plenty softened the epicarp in its gizzard. This made germination possible. With the disappearance of the dodo there was no natural agency left to aid the calveria seed to germinate. The last dodo and the last natural germination of the calveria seed corresponded in point of time - 300 years ago.

The dodo is dead and gone and the calveria tree is following the dodo to its doom. The pity is that we now know why the calveria tree is becoming extinct but there is nothing we can do about it.

Source: Scientific American.

Land & Water: Agriculture was man's first great challenge to natural systems. He cleared forests to grow food for himself and built huge irrigation systems to assure a perpetual supply of water for his crops— and prospered. The ancients knew, as Plato tells us, that over-cropping and over-grazing will lead to soil erosion which may make deserts

of fertile land. But that did not stop them. Look at the debris which our great civilizations have left behind them.

Ancient Sumeria—modern Iraq—was the granary of the great *Babylonian Empire*. The Sumerians harvested two crops and grazed sheep between the crops. Today less than 20 per cent of the land in Iraq is cultivated. "The

landscape is dotted with mounds representing forgotten towns, the ancient irrigation works are filled with silt—the end product of soil erosion—and the ancient seaport of Urs is now 150 miles from the sea with its buildings buried under as much as 35 feet of silt" *

Take a much later civilization in another continent—the *Mayan civilization* in America. "Archaeologists have long wondered how the Mayas managed to support what was obviously a high civilization on the now unproductive soils of Guatemala and Yucatan. Evidently, they exploited the land as intensively as possible until both its fertility and their civilization collapsed." "Sorry stories like this could be told of country after country."†

Salinity: Apart from erosion there is another factor that may convert good land into barren tracts. This is salinity. Salinity appears where the groundwater table is lowered owing to the excessive consumption of groundwater resources. All over the world there are large tracts of land blighted by salinity—in Mexico and several other parts of America, in Tanzania and many other parts of Africa, in India, China and South East Asia. In spite of this bitter experience, the reckless tapping of underground water goes on merrily all over the world. Peter White writing on Greece in the *National Geographic* (March 1980) says, "Driving eastward in Macedonia, I get more intimations of new-found prosperity....Around Pella so many wells have been dug that the fountain of Alexander the Great has dried up".

We have through the centuries created vast deserts of fertile lands. But we do not yet know how to make the deserts bloom. Despite the claims of Israel, it is still a far-off dream. All our natural resources are going the same way. We are consuming our minerals with an abandon that is hardly credible. According to one 'guestimate' iron may last till 2500 A.D. Aluminium and magnesium and some other minerals may be available till 2100. But lead and several other materials may disappear even earlier, say by about 2050 A.D. There are several other guestimates. They all tell the same tale. We are running dangerously short of essential raw

materials.

Alternate Power: Since the Industrial Revolution our exploitation of natural power resources, coal and oil, has assumed alarming proportions. The Industrial Revolution itself was powered by coal. Then came oil. Both threaten to give out, oil sooner than coal (see *Coal, Oil*). Now that the OPEC countries are holding the rest of the world to ransom for oil, we have begun to think of alternate sources of power that will not run out on us like coal and oil. This is the only silver lining on the overcast power front.

What we destroy, we can't replace. Nor can nature—not at this speed. It has taken millions of years for nature to stock up our present supply of minerals and fossil fuels but it will take us only a few centuries to run through them. As pillagers and predators, we surpass all other species just as we do as thinkers and creators. Only our thinking and creative abilities are poor compared to our capacity for unthinking destruction.

Dumping Waste: No bird fouls its own nest. But the doubly wise man (*homo sapiens*)§ excels in this obnoxious practice. It has been estimated that in Britain the average person throws out about 1.5 lb of garbage every day. In the US the wastes dumped into the biosphere are much greater—more than 4.5 lb per person per day. To these familiar wastes are added whole heaps of industrial by-products, which neither the producer nor the consumer wants.

The advance of technology in recent years has been dubbed the *Technological Revolution*. This revolution, like all revolutions, has backfired. While at one end it has hastened the consumption of scarce materials, it has at the other end thrown up a lot of unwanted wastes. These wastes are piling up and have already become unmanageable. Some of these wastes like synthetic plastics are not 'bio-degradable'. Therefore they may persist for years as abiding threats to the ecosystem.

Pollutants: But worst of all are the pollutants which a sophisticated technology has been spewing all around us. Careful

* La Mont Cole, Chairman, Dept. of Zoology, Cornell University

† Ibid.

§ See *Descent of Man* infra

Black Death of Forests

Forests are dying. Those luxuriant woods unaffected by the cancer of industrial toxin are being maimed by wood-cutters. According to *Spectrum*, the British Science Journal, the rate of continuing deforestation is estimated at between 20 and 50 hectares per minute. *Time* (Sept. 16, 1985) points out, the disease strikes selectively but with deadly effect.

Time's report says: In the case of a spruce tree, the dark green branches at first hang limply, like Spanish moss. Between five weeks and three years later, the branches are tinged with yellow and then brown. The weakened tree soon drops its needles and eventually stops growing new ones. It becomes bald at the top and appears stunted, spreading its highest branches outward and upward like a stork's nest.

In a desperate struggle for life, it may grow excessive numbers of cones or sprout "anxiety shoots"—tiny branches that grow irregularly along the bough. Roots and trunks begin to twist and shrink. Finally, drought, frost, insects and parasites finish off the weakened plant. In the end, it stands like a bony finger pointing toward the sky.

In Asia and much of the Third World, trees are still destroyed the old-fashioned way: they are cut down for fuel and cropland. In Europe, there is a new and potentially more deadly culprit. The Germans call it *Waldsterben*, the dying-forest syndrome. But the disease is far more than a German phenomenon. Since it was first observed by German Scientists in the autumn of 1980, the mysterious malady has raced across Europe, blighting woods in countries as far apart as

Sweden and Italy. It has also worked its way across varietal lines, attacking needle trees such as fir, spruce and pine as well as leaf trees such as beech and oak.

The upshot is that Europe now faces one of the most serious environmental catastrophes of modern times. Concluded an essay by Herman Graf Hatzfeldt, a forest owner, in the West German weekly *Die Zeit*: "Without doubt, the existence of the entire forest of central Europe.....is menaced."

In France, only 5,000 hectares (one hectare equals 2.47 acres) of woodland have been seriously damaged, but 30,000 are showing signs of deterioration. Worst hit are the Vosges Mountains in the north-east, where one out of every five trees is either sick or dying, and the Jura range to the south, where 11% of the trees are affected. In San Rossore, a presidential retreat on the Italian coast due west of Pisa, once stately umbrella pine trees have been reduced to barren stumps. In the forests of Vallombrosa, southeast of Florence, some 8,000 trees are dead or decaying. "In 1982 beech trees were seen to be affected," says Fabio Clauser, administrator of the Vallombrosa Nature Preserve. "A year later, the red fir. Today all varieties show the same indications. The dying trunks look a war cemetery."

The epidemic of dying trees has swept through Europe as mercilessly as the *Black Death* did in the Middle Ages—and in ways that are just as mysterious. The new plague hits young saplings as well as 120-year-old firs and strikes individual trees as frequently as whole forests. Even the course of the illness has been difficult to pinpoint.

studies have shown that air pollution can damage vegetable crops and in general affect plant growth. This is reflected in the low nutrient quality of the plant products and consequent ill effects on the health of the

animals and people who depend upon these crops. Here again, we have a remarkable *amplification*†. But far more important are effects that arise secondarily.

† See Prof. Commoner above

Effluents: These are wastes containing assimilable nitrogen and phosphates which our factories are discharging into surface waters, like rivers and lakes. They enrich the water leading to the overgrowth of algae and similar organisms to the detriment of other organisms and finally to the extinguishment of all. "As large a body of water as Lake Erie", says Commoner, "has already been overwhelmed by pollutants and has in effect died...Sewage and industrial wastes and run-off from heavily fertilised farmlands have loaded the waters of the lake with so much excess phosphate and nitrate as to jar the biology of the lake permanently out of balance. The fish are all but gone".

Carbon dioxide: The widespread use of combustible fuels bodes ill for all species of animals in two ways. It depletes the oxygen supply and increases carbon supply.

"When and if we reach the point, where the rate of combustion exceeds the rate of photosynthesis, we have not only to worry about running out of oxygen at night (there is no photosynthesis in the absence of light) and in winter but the oxygen content of the atmosphere will actually decrease"†† while the carbon dioxide content increased.

"Between 1860 and 1960, the combustible fuels added nearly 14 per cent to the carbon dioxide content of the air, which had until then remained constant for many centuries"★★ When you burn a ton of hydrocarbon you obtain as byproducts about one and one third tons of water and about twice this amount of carbon dioxide. "Both carbon dioxide and water vapour make a huge green house of the Earth because while they

allow sunlight (short wave radiation) to reach the Earth, they prevent longwave heat radiation from the Earth escaping into space (see *Heat cycle, Biosphere* supra). The temperature of the Earth is therefore certain to rise as the amounts of carbon dioxide in the atmosphere increase".

"However, the greatest single source of contamination of the planet now is radio activity, from the explosions of nuclear weapons in the atmosphere. Fallout from nuclear tests contaminates every part of the Earth's surface and all its inhabitants" †

Green Movement: It seems that mankind's consciousness has been aroused very strongly about the need for environmental protection and ecological preservation in recent years. Protest rallies and mass demonstrations around the globe are indications of the growing awareness. Green Movements sprouted in US, Europe & Australia. India has its Chipko Movement.

Environmentalists under the banner of 'Greens' won 28 seats in West German Parliamentary Election in 1983 and Green Peace, the environmental protest group maintained its pressure on governments to ensure adequate protection to life on Earth. Nuclear explosion and dumping of nuclear and toxic chemical wastes without safety measures were stoutly opposed in many parts of the world.

Green Peace Ship 'Rainbow Warrior' which was on its way to lead a "Peace fleet" to the French nuclear test site at Mururoa Atoll in the Pacific was sunk in Auckland harbour on July 10, 1985 by French agents and the ensuing political scandal shook the very foundation of the French Government.

34. EVOLUTION

Since the Earth came into existence some 4600 millions of years ago, it has had a history of continuous change. Its surface had been broken apart and re-formed by violent geological movements from time to time.

Old mountains have been weathered down to stumps while new mountains have been built. Land has been sub-merged under the sea in certain places and the sea

has given way to land in others. The face of the Earth kept changing like the patterns in a kaleidoscope through successive geological eras. As continenets and seas changed and climates altered, life was modified time and

†† La Mont Cole

★★ La Monti Cole

† Barry Commoner

again, to suit the changing environment.

Geological History: The geological history of the Earth is divided into two great Eons, the *Cryptozoic Eon* or the age of hidden life and the *Phanerozoic Eon* or the age of well displayed life. The *Cryptozoic Eon* covers all of what is called the Pre-Cambrian era and goes back to the very beginnings of the Earth. The *Phanerozoic Eon* includes all eras beginning with the Cambrian Era and coming down to the Holocene Era which covers the modern times.

The eras themselves are subdivided into periods or systems depending on the dominance of one or another kind of flora or fauna. There are four major eras. 1. The Pre-Cambrian Era. This is the only era that belongs to the *Cryptozoic Eon*. 2. Palaeozoic Era. This is the first era of the *Phanerozoic Eon*, and shows old forms of life. 3. The Mesozoic Era, the second era of the *Phanerozoic Eon*, shows middle forms of life. 4. The Caenozoic Era, the last era of the *Phanerozoic Eon*, shows the recent forms of life.

The Caenozoic Era: While the Palaeozoic and Mesozoic eras have been divided into regular periods, like the Cambrian age or the Triassic age, the Caenozoic era has been divided into sub-eras and then divided into periods like the Palaeocene, Eocene or Oligocene ages. At first, the Caenozoic era was divided into three minor eras as follows: The *Primary*, comprising the oldest rock formations, the *Secondary*, comprising intermediate rock formations and the *Tertiary* (third) comprising the youngest rock formations. When still younger rocks were discovered, they were classed as *quaternary* (fourth). The two important sub-eras of the Caenozoic era are the *Tertiary* and the *Quaternary*.

The current geological period is called the Holocene age which began 10,000 years ago. The earliest geological era is Pre-Cambrian which began 4600 million years ago.

Geological Changes: *Cryptozoic Eon* opens with the very beginning of the Earth, when it starts as a whirling mass of gas, held by the gravitational pull of the Sun. The gases condense into liquids and liquids solidify to form the outer crust of the Earth.

The thick steamy vapour surrounding the earth Falls down as heavy rains to produce the first oceans and rivers. The rocky crust, baked by hot winds and cooled by heavy rains, weathers down to form soil and sand.

Pre-Cambrian Era (4600 million to 600 m. years ago). First signs of life represented by microcosms, appear in this age.

Phanerozoic Eon covers the entire period from Cambrian Age to Holocene Age.

Cambrian Age (600 to 500 m. yrs.) Rocks form on the Earth. Climatic conditions become warmer. Life exists only in the seas. Seaweeds remain the only plants. Worms, jellyfish and sponges form the main groups of invertebrates.

Ordovician age 500–440 m. years. Seaweeds and invertebrates continue in the seas, but the first vertebrates appear.

Silurian age 440–400 m. years. Plants appear on land. More species of vertebrates appear in the seas. Plant life becomes more varied in the seas and coral reefs develop.

Devonian age 400–350 m. years. Vegetation begins to thrive on land. The first fishes appear in the seas. The first invertebrate animals, millipedes, mites, spiders and wingless insects appear on land.

Carboniferous age 350–270 m. years. Giant evergreen plants appear in tropical swamps. Amphibious creatures evolve. Marine life in plants and animals show many varieties. Reptiles breed on land. Some insects develop wings.

Permian age 270–225 m. years. The super-continent *Pangaea* breaks up, creating *Laurasia* in the north and *Gondwana* in the south.

Deciduous plants able to withstand extremes of climate dominate. Land animals increase in variety and numbers and end the dominance of the marine creatures.

Triassic age 225–180 m. years. *Gondwana* breaks up into two blocks: (1) South America and Africa, with Arabia attached, (2) Antarctica, Australia and India.

Coniferous plants, cycads and ferns increase. Some cycads have embryonic flowers. The first mammals (warm-blooded creatures) evolve from the reptiles. Dinosaurs, barely six inches long, are present for the first time. The first flies and termites appear.

Jurassic age 180–135 m. years. India breaks away from Antarctica and Australia and moves north. Australia is parted from Antarctica, South America and Africa separately.

Reptiles increase in size and variety on land. The first birds evolve feathers from scales. Huge reptiles weighing as much as 34 tons roam the Earth. Mammals remain small, no bigger than rats, and live in the woodlands.

Cretaceous age 135–70 m. years. India jams into South Asia lifting up the Tibetan Plateau and the Himalayan Ranges. The Andes form in South America.

Giant reptiles like the dinosaurs dominate the land at the beginning of the age, but disappear towards the close. Placental mammals (whose young are nourished directly by the mother's blood until birth) appear.

Palaeocene age 70–60 m. years. Striking climatic variations and physical changes occur, as a result of widespread elevation of land out of sea. Many organisms perish. The surviving species give rise to fresh stocks, by specialisation of structure and habit to suit the changed environmental conditions.

Eocene age 60–40 m. years. Flowering plants dominate. Marine reptiles become extinct. Some species of mammals like the whale and the sea-cow adapt themselves to the sea. Most fish assume the present forms. The ancestors of the big mammals – elephant, rhinoceros, horse and cattle – appear. Primitive monkeys are seen.

Oligocene age 40–24 m. years. Land mass moves at the expense of the sea. The Alps begin to form. The Himalayas rise higher.

New species of crabs and snails evolve. The ancestors of cats, dogs and bears appear. Tailless primitive apes seen. Plant-eating animals increase.

Miocene age 25–3 m. years. Arabia separates from Africa and attaches itself to Asia. The Red Sea and the Gulf of Aden form. The Mediterranean is land-locked. The Himalayas rise still higher.

Bony fish increase in variety. Elephants and other mammals grow in size.

Pliocene age 3–1 m. years. The continents assume the present forms. Land subsidence leads to the formation of the North Sea, Black and Caspian Seas and the Sea of Aral.

Marine life assumes more or less the

Flying Giant

The biggest bird alive now is the ostrich and it cannot do what most birds can, that is, fly. The largest flying bird today is the condor of the Americas. However, when compared to the 'Jumbo' of the bird world these are mere pygmies. Two Argentinian paleontologists, Eduardo Tonni and Rosendo Pascual, have found the fossils of a giant flying bird. Weighing about 77.5 kg, it measured 3.4 metres from the tip of its beak to its tail tip; each wing measured about 1.2 metres and the largest wing feathers measuring 1.5 metres long were about 18 cm across. It stood 1.8 m tall and its wing-spread was 7.5 m. It is said to have sailed the skies some eight to five million years ago.

Source: Science To-day.

existing forms. Mammal species decline in variety. Man-like apes and elephants thrive. Mammoth creatures on land and sea become extinct.

Pleistocene age 1 million years. A period of abnormal and extreme climatic changes. Mountainous ice sheets cover the major portion of the earth. The ice melts periodically raising the sea level. Land masses, pressed down by ice, begin to rise as the ice retreats. Melting ice forms the Great Lakes of America and the lakes in Southern Europe.

Many plants in Europe perish leaving only hardy trees like oak and elm. Ape-like creatures begin to make tools. Modern elephants, horses and oxen appear.

Pleistocene age (otherwise known as Ice age) is generally sub-divided into (1) Lower Pleistocene, between 1 million and 500,000 years ago; (2) Middle Pleistocene, between 500,000 and 100,000 years ago and (3) Upper Pleistocene, between 100,000 and 10,000 years ago.

Holocene age. This is the present geological age which began 10,000 years ago. Ice retreats and warmer climate prevails over the major portion of the earth. Vegetation thrives. Man learns the domestication of animals and the science of cultivation.

35. DESCENT OF MAN★

Man has appropriated to himself the highest echelon in the biological hierarchy. But for all his pretensions of superiority he could not rid himself of many characteristics which he shared with lowlier species during the evolutionary process.

Biologically man belongs to the family of mammals and among mammals to a sub-family called the placental mammals. As a mammal he shares with other mammals, warm blood, hair and milk glands. As a placental mammal his young are carried by the female for a long period prior to birth, attached by a placenta to the uterus, through which the child receives nourishment from the mother's bloodstream.

Mammals: The mammals are today the most biologically advanced species and dominate the world of organic life. But more than 75 millions of years ago when gigantic reptiles ruled the Earth, the mammals were a frightened and insecure group. In order to survive and reproduce "this early stock of hairy warm-blooded creatures (of whom the tiny shrew is typical) had to keep to secret ways or to the dark, had to eat whatever could be found and had to carry their developing young within them rather than lay eggs where they could too easily be discovered (by other animals).

"They were on the run, driven more or less underground or to foraging at dusk or through the night—a desperate kind of life that demanded a high fertility and a quick replacement of generations."‡ This explains the fantastic evolutionary progress that the mammals had achieved. They had changed from the tiny scurrying creatures they were into undaunted hunters lording it over all other species.

Primates: Among mammals, man be-

* The title 'Descent of Man' used by Darwin has been amended by a later anthropologist as the 'Ascent of Man', which is also true

‡ Norman J. Berril—(Bracketed sections ours)

longs to the order of Primates. The Primates are distinguished by hands eminently adapted for grasping, an excellent vision, a keen sense of hearing but a poor sense of smell. The primates consist of monkeys, apes and man. The monkeys form a class by themselves, called the Lower Primates or Prosimians. Lemurs, lorises, tarsiers and tree shrews belong to this group.

Man and the apes together make up the Higher Primates or antropoids. The antropoids are in their turn divided into two groups, the *Pongidae* (apes) and the *Hominidae* (man). The hominidae differ from the pongidae in the shape and structure of the pelvis, legs and feet. This means that the hominidae can walk upright on their legs while pongidae have to use their hands as well for locomotion. The pongidae comprise four families—the gorilla and the chimpanzee of Africa and the gibbon and orang-utan of South-East-Asia. The hominidae consist of only one family—man.

Human Revolution: According to Charles F. Hockett, the *Homo Erectus* represents our earliest truly human ancestors. He says "As soon as the hominids had achieved upright posture, bipedal gait, the use of hands for manipulating, for carrying, for manufacturing generalised tools and language, they had become men. The human revolution was over."

"The species *Homo Erectus* lived at some time during the Middle Pleistocene apparently in a tremendous territory extending from Java and China to Europe, North Africa and may be to South Africa"†. This

† Charles F. Hockett

species was the first to achieve what may be called the *Homo Erectus Complex*. This consisted of six items, 1. Achieving prelanguage, 2. developing striding gait instead of shuffling gait, 3. successfully venturing out into open savanna or grassland, 4. engaging in more extensive and effective hunts with more co-operation, 5. developing more advanced carrying techniques, and 6. beginning to lose their hair.‡

Homo Sapiens: The next turning point in evolution came around 50,000 years ago, in the warm interval when the ice was retreating in the Pleistocene age. Around this time, a new type of man, the *Homo Sapiens* (thinking man), began to crop up here and there in the form of various successful mutations. By this time, says Charles F. Hockett, "the genus *Homo* consisted of a single, tightly connected, widespread but highly diverse species. All non-striding hominids were long gone. All surviving hominids were heirs to the full erectus complex. The brain had grown approximately to its present size with some variation in average mass from one population to another".

The sapiens complex as it emerged showed four distinctive features: 1. a more efficient brain, 2. true language, 3. a flat face, and 4. exploitation of the kinds of articulatory motions that are now universal.

The new complex emerged within the framework of the erectus complex and did not undo any of its advantageous features. But it was a new key complex and gave rise to a new adaptive radiation, the second phase of human radiation. The sapiens complex spread just as the erectus complex did—by migration and gene flow.★

The tempo, however, was almost unbelievable. The complex bestowed upon those who attained it an unprecedented capacity to co-operate, to move, to improve technology, to adapt and to absorb or eliminate less gifted competitors.

Neanderthals: By about 40,000 years ago, there was no surviving group of hominids anywhere (with the possible exception of the Neanderthals) who had not absorbed the improved techniques. The Neanderthals

Homo Sapiens

The biological species of modern man was originally called homo sapiens (thinking man). In recent years an extra sapiens has been added by some anthropologists. They think that the Neanderthals were sub-species of homo sapiens and have accordingly named them homo sapiens Neanderthalensis. This makes the Neanderthals the ancestors of the modern man. Though this view is not accepted by all anthropologists the name homo sapiens sapiens has become necessary to distinguish the modern man from the Neanderthals.

Source: Scientific American.

persisted in Europe for many years after the sapiens complex became established. This tells us that the sapiens complex did not arise in Europe. But neither do we know where the sapiens complex originated. The Neanderthals lacked the flat baby face that had appeared elsewhere (among the sapiens) and their brains averaged somewhat larger than our own today or that of the Old World contemporaries of the Neanderthals.

Some years ago it was thought that two specimens we had recovered from Europe (Combe Cappel and CroMagnon) represented the first homo sapiens. This is now seriously questioned. None of the fossils we have so far unearthed can qualify as the fossils of the homo sapiens. This means that for the present, this rung (the transition from homo erectus to homo sapiens) has to be treated as missing from the evolutionary ladder.

Homo sapiens is most notable for his extremely rapid cultural advances. He improved upon the tools his forbears had left and created new ones, more efficient and sophisticated. He mastered the art of abstraction and the power to retain and reproduce images, long after the originals had disappeared. This led him into painting and sculpture. He had an active awareness of the supernatural and practised some sort of religion. He loved beauty and delighted in adorning himself. He laid the foundations on which our modern civilization is built

‡ Ibid

★ See *Ethnology*, infra

36. ETHNOLOGY

Ethnology is the science of human races. It is part of a much wider discipline, Anthropology. Anthropology deals with man as a biological species and covers all aspects of human life, evolutionary, physical, social, psychic and cultural.

Anthropology is one of those sciences that have undergone a thorough overhauling in the 20th century. Ethnology in particular has been practically re-written.

Old Anthropology: Blumenbach, the father of physical anthropology, divided mankind into 5 races on the basis of colour—white, black, brown, yellow and red. This superficial classification was replaced later by a more sophisticated classification based on physical measurements, or *Anthropometry*. These included measurements of stature, shoulder width, and the length and breadth of the head. The head or skull measurements were worked out as cephalic or cranial index, that is breadth expressed as a percentage of the length. Long heads with low cephalic or cranial index (below 76) were termed *dolicocephalic* or long-headed and those with a high index (above 81) were termed *brachycephalic* or broad-headed. Noses were similarly classified as leptorrhine (long-nosed), chamaerhine (broad-nosed) or mesorrhine (medium-nosed).

On these and other bases mankind was divided into 3 primary races *Mongoloid*, *Negroid* and *Caucasoid*. Mongoloids are round-headed with broad jaw bones, straight black hair, sparse body hair and yellow to brown skin. Typically, they have an extra fold of skin in front of their eyelids (the epicanthic fold) which gives the impression of their having narrow or even slanting eyes. Negroids are long-headed, woolly-haired, and have protrusive jaws. Their skin ranges from light brown to black. Caucasoids have straight or wavy blond to black hair, skin fair to dark brown and eyes blue, grey or brown.

Homo Sapiens is a single biological species. A biological species may be distinguished as a group which cannot interbreed with any species outside it. In the words of

Prof. Dobshansky "mankind is a clear-cut, discrete, and closed genetic unit."

One of the most remarkable features of the human population is its endless variety. Among 4.7 billion or so of humans* we find no duplicates except in the case of identical twins (as distinguished from fraternal twins). Each person is biologically unique and is dissimilar to others. This uniqueness is the result of heredity which every person inherits and the environment in which that person grows up or develops.

Adaptations: Many physical characteristics of a population are simply adaptations to environments. If there is a change of environment, as it often happens in migrations, the physical traits are also liable to change. As Dobshansky says, "No gene complement is the paragon of adaptability superior in all environments". So it is quite likely that the genes unfavourable to the new environment will by a process of Natural Selection be eliminated and the formation of favourable genes will be promoted.

The colour of the skin, the colour, quantity and texture of the hair, as Carleton S. Coon says, "now seem to be very poor criteria" for determining races. Similarly the cephalic index has also been found to be unreliable. R. L. Lehrman says, "In one study it was found that the children of long-headed Sicilians living in New York were more roundheaded than their parents, the cranial (cephalic) index having increased from 77.7 per cent to 81.5 per cent. By contrast, the children of round-headed Jews grew up with longer heads the change being from 83.0 per cent to 81.4 per cent. If the cranial index can show such variation in the space of just one generation how can it be considered a hereditary racial trait?"

* According to UN Statistics in 1983. 4.72 billion

Race Conception: "Race in popular usage," says L.C. Dunn, "is a word with many shades of meaning and connotations and has become so emotionally loaded that some scientists would like to do away with it altogether in referring to human groups. But to the evolutionary biologist it has a clear and unambiguous meaning. A race is a population which differs from other populations in the frequency of some of its genes". The biological conception of race is thus flexible and relative and not fixed and absolute. We put together as members of a race populations which have many, perhaps most, of their genes in common.

"Owing to geographic and social factors," says Theodosius Dobzhansky, "mankind is divided and subdivided into a multitude of overlapping and criss-crossing Mendelian populations". A Mendelian population is a reproductive community of individuals who share in a common gene pool.

Two Types: A person inherits genes from his parents in equal proportions. These determine his individual traits. These traits are moderated by the environment in which he grows up. The totality of genes inherited by a person constitutes his *genotype*. The development or growth of this genotype is neither completed in the womb, nor concluded at birth. The development goes on through life from infancy to adolescence, from adolescence to maturity, from maturity to senility and ultimately to death.

The sum total of the observable characteristics of the genotype through all these stages is termed his *phenotype*. The genes interact with the environment and the outcome is the process of development or aging. Development results in an orderly succession of phenotypes. The genotype determines the reactions and responses of the developing or aging organisms to the environment: it determines the norm of reaction". (Dobzhansky).

Geography & Culture: "The races of *Homo Sapiens*," says Bently Glass, "whether we lump them into a few or split them into a great many, are clearly of geographic origin". The geographical environment is thus the prime factor in the formation of different races. The geographical environment affects our culture too.

The Eskimos know how to kill a whale but

not an elephant. An Indian or an African may know how to kill an elephant but he would be utterly flabbergasted when confronted by a whale. In the same way our dress, food habits and such other things which form part of our culture are always adjusted to conform to the physical environment. We may even set out to alter the environment to suit our needs, for example, by cutting down forests for agricultural purposes.

Culture is an extra-biological method of adaptation. It interacts with our heredity and environment in complex ways. We may achieve adaptation to our environment through 'learned' or conscious responses, instead of by our instinctive reactions. Such 'learned' adaptations are clearly cultural in origin.

Culture & Physiology: Culture is a property of the whole population, not of an individual. Language, that universal glue which holds cultures together, has no meaning for an isolated person. Unless somebody taught him to speak he cannot even talk to himself. It is now becoming increasingly clear that physiological features characteristic of a human population may be produced by their culture.

Take over-bite, for example. Most human populations have developed overbite, that is, the upper incisors come down over the lower ones when the mouth is closed. But in modern Eskimos the incisors meet edge to edge in the closed mouth, as it did in our remote ancestors*. This peculiar characteristic of the Eskimos was long treated as a racial feature. Today, however, we see that young Eskimos have developed over-bite.

Mutation: The major factors that operate in the evolution of races are three: *Mutation*, *Natural Selection* and *Gene Flow*. Mutation is a change in the structure of the gene itself. Such a change can be favourable or unfavourable to the species. We say a mutation is favourable when it helps the species to fare better in the struggle for survival.

In the early human communities the chances of a favourable mutation were quite limited because the communities were themselves very small. "Today, on the contrary,

* The edge-to-edge bite prevailed in England till the 11th century A.D

our breeding populations are so large that any favourable mutation is quite likely to arise in every population frequently....In a population of 100 million individuals a mutation with frequency of 1 in a million will arise 200 times per generation". (Bently Glass).

Natural Selection is another process by which nature intervenes in evolution. All populations have the same chance for a mutation—around one in a million. But whether or not a new gene produced by mutation remains in the population after its first appearance depends on the action of other evolutionary agencies like Natural Selection. If the new gene is favourable to the species, natural selection will operate to promote the reproduction of such persons who carry the new gene and reduce the reproductive rate of others. Thus the next generation will contain a greater number of persons who carry the favourable gene. Similarly carriers of unfavourable genes will have their productivity lowered so that succeeding generations will contain fewer members carrying the unfavourable genes.

This is only one of the many ways in which Natural Selection operates, perhaps, the

most obvious. There are many other ways in which Natural Selection can intervene in the fortunes of a race. But its processes are mostly obscure and take many years to make themselves felt.

Gene Flow means the flow of genes from parents to children. This has a great impact on evolution when inter-breeding takes place between two races with different gene pools. History is replete with such interbreeding. Thus the gene pool of North American Negroes is now approximately 30 percent derived from white ancestry. In South America the amalgamation is considerably greater. The original races in S. America are in fact disappearing, though it may take thousands of years before a new biological group is evolved.

When two persons of different races marry, the children inherit half their genes from one parent and the other half from the other parent. A new gene pool is thus created. This is stirred up and re-aligned every generation. So within a number of generations a new race may show up with a constellation of genes widely different from those of the original parents.

37. THE NEW BIOLOGY

The New Biology, technically known as *Molecular Biology*, is a revolutionary development. In the way it has upset conventional ideas, it resembles the Plate Tectonics theory in geology. In its complexity and range, it challenges comparison with the latest advances in astrophysics. Here, physics, chemistry and biology have joined hands to unravel the mysteries of life.

The name *Molecular Biology* is derived from the fact that the new biology deals almost exclusively with biological molecules – mostly protein molecules. Molecules are the smallest particles of matter that can exist in a free state. They are themselves composed of still smaller particles called atoms which again are the smallest particles of an element.

With the splitting of the atom and the discovery of sub-atomic particles, physics has opened up a new world of highly intriguing phenomena. This had the indirect effect of degrading the molecule as an insignificant concept. The new biology has

reinstated the molecule. The molecules have now become highly significant units which have opened up another new world, as awesome and complex as the sub-atomic world. This is the world of the cell, the smallest unit of life.

The Cell. The cell is the smallest unit of life that is capable of independent existence. It occurs in all living organisms, plants, bacteria, insects, animals and men. The average diameter of a cell is between 1/50 and 1/100 millimeter. Some cells are even smaller, about 1/200 mm. The largest human cell is the *ovum*, which is just visible to the

naked eye. No other human cell is visible without a microscope. The molecular composition of the cell itself and the endless range of protein molecules that the cell synthesises, form the subject matter of the *new (molecular) biology*.

The smallest living organism (the bacterium) contains only one cell. As we go higher up the biological ladder the number of cells increases manifold. In man, the number goes up to a hundred trillion (100 followed by 12 zeros) or more. Every square inch of our skin contains about a million cells. The brain is made up of some 30 billion cells (30 followed by 9 zeros). Our blood contains about 20 trillion. They are so small that it would take about 30,000 of them to fill an area of one sq. mm. Cells are found in different shapes. Some are spheres, some are rectangular and some others spirals. Some have tails and some (nerve cells) are star-shaped with wispy arms, several feet in length.

The human cell is the result of billions of years of evolution. Its structure is so complicated and the varieties of proteins it produces so numerous that it is a world in and by itself – a micro-universe, containing many minute bodies functioning in unison. These miniscule bodies can operate in time limits as small as thousandths of a second and in perfect tune with the biological rhythm which it has inherited from its remote ancestors in the primordial ocean. Every little movement of our body, every breath that we take, the wink of an eye or the curl of a lip is the ultimate result of the activities of millions of cells in different parts of the body, functioning with split-second precision.

Jelly Blob. Each cell appears to be a blob of jelly filled with tiny molecular structures. Even the largest of these molecules like the DNA is measured in microscopic units called *angstroms*[†], 1/250,000,000 of an inch. The whole cell is surrounded by a fine but strong membrane – the *cell membrane* – which is only 500,000th of an inch in thickness. The cell has a dense kernel called the *nucleus*, which controls the activities of the rest of the cell. Outside the nucleus, the cell is filled with a gelatinous substance called *cytoplasm*, which contains various bodies, collectively called *organelles*, which are

themselves enveloped in thin membranes of their own.

Every cell has a complicated calendar of its own – when to grow, when to divide and when to die. Of course, all cells of the same type follow the same routine and observe the same timetable. The cell shows the maximum activity when it divides and multiplies. The cell division is itself a strictly controlled activity.

A human cell in a laboratory (that is, outside the bodily environment) divides some fifty times before dying. This seems to be its maximum rate of reproduction and maximum span of life. (This is a logical guess, not a proved fact). Of course, all cells do not divide fifty times. Each cell follows the programme laid down by its genes. If all our cells divided fifty times we would reach gigantic proportions and may weigh in trillions of tons. This is one reason why the division and multiplication programme is kept under strict control.

Every cell contains the entire repertoire of genes for that plant or animal. That is to say, every cell in the body, no matter where, has the potential capacity to differentiate into various organs – hands, feet, heart, liver etc. so as to create a complete individual of the species. It is this capacity of the cell that has made *clones* possible (see *infra*).

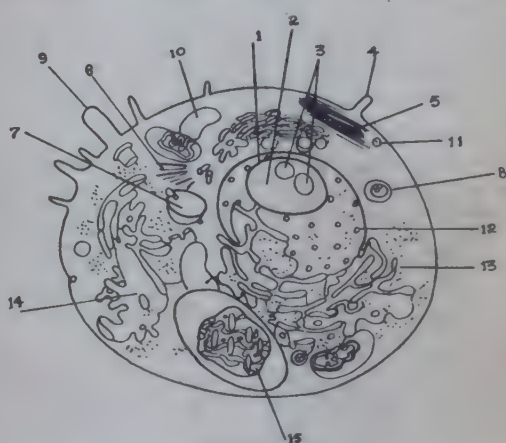
The Nucleus. The nucleus of the cell contains the master plan for building up a full specimen of the species. The master plan is contained in fibres of the protein-laced DNA called *Chromosomes*. Each chromosome is a package of DNA divided into hundreds of *Genes*. Genes, for specific physical features like blue eyes or curly hair, are located at specific points on the chromosomes. It is from these chromosomes that the genes send out the necessary instructions for the production of proteins or other activities of the cell. Another important body in the nucleus is the *nucleoli* which contain concentrations of RNA. The nucleus with its chromosomes and nucleoli is encased in a thin membrane called the *nuclear envelope*.

Cytoplasm. The cytoplasm is reinforced by bundles and strands of fibres. These *microtubules* and *micro-filaments* form the muscles of the cell. They keep up the

[†]See S. 2.

The Cell

We are by weight 70 per cent fluid, the same percentage of the Earth's surface that is covered by the oceans. The sea within us has the same saltiness as the pre-Cambrian seas of 3 billion years ago. It is thought that life originated from the saline broth that the pre-Cambrian seas supplied. As a foetus, man has to spend his first months in a sac of saline solution in the uterine. After birth, the human cells – not the human body as a whole – float in a similar sea of fluids. It is from these fluids that the cell draws its nutrients and the raw materials necessary for protein synthesis. The covering of the cell – the cell membrane – allows in and out passage to proteins and other materials.



1. The Nucleus, the core and controlling centre of the cell. It is enclosed in a thin but strong membrane called the nuclear envelope.

2. The Chromosome is a package of DNA molecules divided into hundreds of genes. It carries our inherited traits and contains the master plan for building the body.

3. The Nucleoli, which contain concentrations of RNA.

4. Microvilli are protrusions on the outer surface of the cell. These enlarge the surface of the cell and increase its absorption.

5. & 6. Micro-filaments (5) and microtubules (6) form muscles of the cell.

7. & 8. Organelles which do scavenging work of the cell. They digest and consume not only foreign matter but also dead parts of the cell itself.

9. Cilia which are found in large numbers on certain cells function as oars, which direct the movements of the cell.

10. Mitochondria are bean-shaped dynamos which provide energy for the cell by burning fats and sugars.

11. Pinocytosis vesicles which act as porters to carry materials from the surface to the interior.

12. Pores on the surface of the nucleus enable substances to pass to and from the nucleus.

13. Ribosomes are small dark particles that congregate in the cytoplasm. They are the anvils on which proteins are made according to RNA directions.

14. The Endoplasmic Reticulum (ER) is a system of interlocking channels which transport cell products.

15. The Chloroplast which occurs only in plant cells carries on photosynthesis.

structure of the cell and, when necessary, help in pulling apart dividing cells. The cell membrane is covered with protrusions called *microvilli* which enlarge the area of the cell surface and promote increased absorption.

The rim of the nucleus is guarded by globules called *lysosomes* which cruise

around the cytoplasm and combat alien intruders. Lysosomes are sacs of corrosive enzymes that can digest almost anything. They also function as sanitising agents which keep the cell clean by destroying worn out cell parts and spent enzymes. For instance, when a tadpole turns into a frog, it is the lysosomes that eat up the tail and eliminate it.

The cytoplasm contains the power system of the cell. These are the bean-shaped dynamos called the *mitochondria*. The mitochondria appear to have been alien bodies in the first instance. They were caught up by the cells in the course of evolution many millions of years ago and have since been used by the cell to provide it the necessary power.

The mitochondria produce energy by burning fats and sugars and store it in the form of ATP (adenosine triphosphate) molecules (see *Biosphere* infra). An active cell requires more than 2 million molecules of ATP a second so as to drive its biochemical machinery. Cells that consume great quantities of energy like those in the wing muscles of birds or in the flagella of a sperm contain thousands of mitochondria.

Ribosome. Ribosomes are vital constituents of the cell. They are quite small bodies, scarcely a millionth of an inch in size. But they perform the crucial task of producing a varied assortment of proteins. With the help of the transfer RNA, they seek out the necessary amino acids from the cytoplasm, which are then in the prescribed order to produce the required proteins.

Endoplasmic Reticulum or ER is a scaffold of inner membranes with a system of interlocking channels through which the cell transports hormones, enzymes and other compounds produced by it. Ribosomes are found as small dark particles congregating in millions in the cytoplasm. They serve as tiny anvils on which the cell mixes proteins in the required patterns. The proteins thus assembled in the ribosomes are passed through the channels of the ER. Some proteins need further processing. This is done by the channels in the ER. When the proteins are ready, they are packed into a membrane called *secretion granule* and carried to the surface of the cell, from where they are expelled for use by whatever organs of the body which require them.

Chloroplast. The chloroplast is unique to plants. Animals do not possess this chemical. Neither do they want it. But, for the plants it is quite essential. Chloroplast does the same work for plants which the mitochondria do for animals. It uses the rays of the Sun

to cook the food necessary for plants from carbon dioxide and water. This cooking process is called *photosynthesis* which provides the plant cells with ATP. Incidentally, it also provides the atmosphere with oxygen (see *Biosphere* supra).

The cell is equipped with a number of triggers which give signals for any operation to begin, continue or stop. The cell has a whole range of signals, green lights, red lights, amber lights. The *repressors*, for example, switch off unnecessary or undesirable activities of any of the cell molecules. Similarly the *inducers* switch on the cell mechanism to start any activity.

Two of the most important of such triggers are the *Receptors* and *Recognition molecules*. The receptors are protein molecules floating in the cytoplasm. They put out branching antennae with which they sense the environment outside the cell and transmit messages to the nucleus. This happens every time something impinges on the sensitive antennae. Thus, it is the receptors on our taste buds (cells) that make us aware of the qualities of the food we eat. If the food is unpalatable the receptors trigger responses that make us spit out the food.

Recognition Molecules. Perhaps the most important of all cell triggers are the recognition molecules. These molecules move about on the surface of the cells. They are the markers of our individualities and enable us to retain our identities as specific individuals of the species. Our blood types are grouped as A, B, AB, or O according to the behaviour of the recognition molecules on our red blood cells. Many transplant patients reject other people's hearts or kidneys mainly because the patient's recognition molecules consider the transplants as foreign bodies and trigger responses to reject them.

What happens here is that the recognition molecules fail to identify the transplants as friendly helpers who have been brought into the body for its own survival. Instead, they consider them as illegal trespassers and signal the body to throw them out. A more important, if less evident, function of the recognition molecules is to find out for what particular cells, particular molecules, say a hormone, have been synthesised and to

direct them unerringly to their destinations or target cells.

This is a most complex and complicated task. Thousands of protein molecules are produced by millions of cells in one part of the body for far off cells in other parts. How to get these innumerable molecules – each to its own destination – without getting them mixed up is a task before which the best minds may quail. And yet it is carried out by the recognition molecules, as a routine job.

Thus all our bodily processes, from heart beat of which we are hardly conscious to hunger which is acutely felt, are in the last analysis determined and regulated by our recognition molecules.

The selective capacity of the recognition molecules enables us to maintain our biological individuality. These molecules direct the cells to absorb or otherwise accommodate cells of their own kind, to resist or destroy inimical cells and to expel or leave alone cells that can neither join the bodily organs nor become dangerous to them.

Antigens. This mechanism is most important to the organism in its fight against invading bacteria. Here, the recognition molecules play the dominant part. They are in fact the corner-stones of our immune system. If dangerous foreign intruders appear, the recognition molecules alert the cells threatened and signals go out to the entire immune system to be on its toes to launch a counter attack.

The intruding molecules called *antigens* are also protein molecules. They are brought in mostly by microbes and are quite often different from the body's own proteins. The presence of antigens in the system provokes the body to produce *anti-bodies*. An antibody is the body's own protein produced in response to a contamination by an antigen. These antibodies summon to their aid other protein molecules of the body like the *macrophagus* and the *lymphocyte*. Acting in concert they often succeed in liquidating the antigens without our being aware of the pitched battles that are often fought. It is when these anti-bodies and their allies lose to the invaders that we go down with one disease or another and seek the help of doctors.

But even when these antibodies lose, our immune system retains clear memories of the battle with the invaders. These enable the system to be better equipped to resist or destroy the same and sometimes similar antigens in a fresh invasion. It is the process that gives us immunity from any particular disease or diseases to which we have once succumbed.

Allergy. Allergy is, in a sense, a misdirected activity of the immune system. It is the body's reaction to foreign proteins which do not otherwise harm the system. It is curious that the antigens which provoke allergy are not always proteins. They include drugs and chemicals and sometimes even simple chemical elements. Such antigens are called *haptens*.

The body's allergic reaction to these haptens is often explained by the fact that these haptens accidentally combine with some bodily protein to form a new foreign protein – *allergen* – which brings antibodies into play. Whatever may be the explanation, it is clear that allergies bring out the biological idiosyncrasies of the individual concerned. Brothers and sisters often differ widely in their allergies. Probably, this difference has something to do with genes but how exactly we have yet to know.

Cancer. Cancer is one of those diseases which remain beyond the control of our immune system. Of course, cancer is not one disease but many. There are some 80 kinds of cancer. What they have in common is that they almost invariably bypass our immune system. Cancer develops when there is an erratic or uncontrolled growth of body cells. Our control mechanism fails and the cells run wild and go on multiplying, choking the normal cells much as weeds choke a garden.

What has happened to our immune system? Why can't it rise to the challenge? One answer suggested is that cancer cells camouflage themselves by hiding their surface antigens. This misleads our recognition molecules which do not alert the immune system. So the cancer cells are left to grow. [See Chapter on AIDS and Cancer]

Change in DNA. Some think that the problem of cancer goes deeper than our recognition molecules and surface antigens. It goes to the very root of the organism – the

genes. They suggest that cancer is caused by mutations* or change in our DNA, so that a key gene or a group of genes no longer works properly. It is suggested that cancer is caused by a virus that manages to pierce the gene and introduce its own DNA into the cell DNA. Once the viral DNA takes over the cell DNA, the cells go on multiplying but the new (multiplied) cells are viral cells and not the

original cells of the organism.

An even more ominous suggestion is that all of us have in our cells genes for an RNA tumour virus which we have inherited from our remote biological ancestors. Normally, these RNAs remain dormant or inactive but now and then they (RNAs) go haywire producing tumour cells that are malignant and uncontrollable.

38. GENES

Gregor Mendel in 1885 showed that certain hereditary factors operate in all biological species. The Danish biologist Wilhelm Johannsen called these factors Genes. The name stuck. It is now known that the genes not only transmit hereditary traits but also mastermind the entire process of life.

The genes are located in the chromosomes which are themselves situated in the nucleus of the cell. The genes, the chromosomes and the nucleus together constitute – to use a famous phrase of Churchill's – "a riddle wrapped in a mystery inside an enigma". The genes form the riddle, the chromosomes represent the mystery and the nucleus the enigma.

Structure. Much of the mystery surrounding the genes was cleared up with the discovery of the structure of the DNA (Deoxyribo Nucleic Acid) announced by J. D. Watson and Francis Crick in April 1953. In structure the DNA resembles a long rope ladder twisted around like a corkscrew. If we straighten the ladder, we shall see that the two sides of the ladder are long chains of two substances – sugars and phosphates – in repeated sequences. These form the backbone of the DNA. Their structure never varies.

The secret of the DNA lies in the rungs that connect the two sides of the ladder. These rungs form two parts or two half-rungs, each half being attached to one side of the ladder. These half-rungs can be one of four types of little molecules: *Adenine (A)*, *Cytosine (C)*, *Thymine (T)*, and *Guanine (G)*. Each of these half-rungs together with the attached segment of the ladder is known as a *nucleotide*. A half-rung on one side will only

join with a specified partner on the other side. This pre-determined arrangement for specific partners suggested that these little molecules formed the letters of a fixed code or the words of a new language. Indeed, it has turned out that this is exactly what they are.

Genetic Code. An *A* will form a rung only with a *T* and a *C* only with a *G*. So, the pairs *A-T*, *T-A*, *C-G* and *G-C* form in a way a four-letter alphabet with which messages can be spelt out. This four-letter alphabet makes up what is known as the *Genetic Code*. The genetic code is not only complex but also extensive. In 1977 Fred Sangar pointed out that the DNA code of a virus, when decoded by the computer came to a print-out of 15 metres. At this rate, the computer print-out for the human DNA would stretch to 16,000 km.

Enormously long strands of DNA intertwine within the core of living cells. So narrow and tightly coiled is this DNA that all the genes in all the cells in a human body would easily fit into a ½ inch cube. Yet, if all these DNA strands are unwound and joined together it would stretch from the Earth to the Sun and back.

Genetic Activities. The genes control all functions of the cell and body growth. The two main events in the life of most cells are multiplication (by division) and synthesis of proteins. Both these operations

are carried out on the basis of the blueprints coded in the genes.

Before a cell divides, the DNA ladder splits down the middle. The nucleotides *As* separate from the *Ts* and the *Cs* from the *Gs* much in the same way as a zipper is pulled apart. Now, the separated nucleotides *A*, *T*, *C*, and *G* pick up appropriate partners from the free-floating nucleotides in the cell. Thus the split ladder becomes two whole ladders of DNA, each an identical copy of the other. Once the division of the DNA is completed the rest of the cells, other organelles also duplicate, ultimately producing two cells of the same type.

Differentiation. The replication of cells in growing bodies is followed by differentiation. Life in most species begins from a single fertilised egg of cell. The single cell becomes a double cell, then a quadruple and so on. At the same time different sets of genes work in different cells evolving specific physical traits, while specialised cells form different organs of the body, hands, legs, brain, heart etc. This process is known as *differentiation*.

Differentiation implies strictly regulated work. The cells concerned concentrate on the task in hand and cease all other activities and when the work is completed they stop working. This switching on and off of genetic activities is achieved by the presence of two molecules attached to the genes – *inducers* and *repressors*. (see *The New Biology* supra).

Heredity. The genes which we inherit from our parents determine our hereditary traits. Hereditary characteristics are not transmitted in a package, as it were. Different genes are responsible for different inherited traits. Each gene functions independently of other genes in this respect. The genes for a particular trait are found at the particular locations in the chromosomes.

Chromosomes are thread-like bodies found in the nucleus of the cell. They are always found in pairs. Chromosomes vary in number according to species. The fruitfly, for example, has 4 pairs or 8 chromosomes in all, and the garden pea has 7 pairs (14 in all). Mice have 20 (40) and humans 23 (46).

Our 46 chromosomes arranged in single file would measure more than 6 feet. Yet they

are contained in the nucleus which is about forty-thousandths of an inch. The nucleus is filled with nucleic acids of two kinds *Ribo Nucleic Acid*, RNA and *Deoxyribo Nucleic Acid*, DNA. The DNA is concentrated in the chromosomes while RNA is seen concentrated in the nucleoli, both of which are in the nucleus.

Protein Synthesis. One of the primary functions of the cell is to manufacture proteins. The human body requires thousands of different proteins. All these are built from 20 amino acids. Each gene (or a distinct segment of the DNA strand) contains instructions for making a specific protein.

The instructions are coded into precise sequence of nucleotides. Just as we can change the meaning of a sentence by rearranging the words, the genes can specify an immense vocabulary of proteins using only the four nucleotides of the DNA – *A*, *T*, *C*, and *G*. All the *A*, *T*, *C*, and *G* in one set of human chromosomes (46 in number) can be put together in billions of different ways.

One geneticist, H. J. Muller, has estimated that the number of different ways of putting together all the *As*, *Ts*, *Cs*, and *Gs* would be the figure 256 followed by 2.4 billion zeros. This is a figure that boggles the imagination. It would be a lifetime job if any one sat down to write out that figure in full. Or, just try it.

RNA. In protein synthesis the DNA is assisted by the RNA (*Ribo Nucleic Acid*). RNA is a single strand as against the double strand of the DNA and is different in composition. That is to say, the RNA has *Uracil (U)* in the place of DNA's *Thymine (T)*. RNA is of two kinds, messenger RNA (mRNA) and transfer RNA (tRNA). When a protein is to be prepared the concerned gene opens. RNA (mRNA) nucleotides attach themselves to the gene and go on growing like a ribbon. This ribbon is the mRNA. It carries the code for making the specific protein.

Proceeding from the gene inside the nucleus the mRNA moves out into the cytoplasm looking for a ribosome for the assembly of the particular protein. The sequence of *As*, *Us*, *Cs* and *Gs* on the messenger RNA forms into groups of 3-letter words like *ACU*, *CGG*, *CCU* etc. The

letter words are called *codons*.

The message carried by the messenger RNA (mRNA) is transferred to the transfer RNA (tRNA). The ribosome with the assistance of the tRNA proceeds to collect the amino acids indicated in the message from the chemicals stored in the cytoplasm. Here, the amino acids are linked together in the sequence given in the code and the synthesis of that particular protein is completed.

Clones. Every cell is equipped with the material and the knowhow to build a full adult of the species. It is therefore possible to reproduce any organism if a living cell from any part of the organism is available. This was proved in the fifties by F. C. Steward of Cornell University. He placed tiny pieces from carrot slices in glass flasks containing

nutritive solutions. He revolved the flasks slowly and released free cells from the carrot pieces. These free cells were left to grow by themselves. They grew into complete carrot plants. An English scientist J. B. Gurdon carried out another experiment with frog's eggs. He destroyed the nuclei in the eggs. The frog eggs were then filled with nuclei taken from a tadpole's intestinal tissues. The eggs developed into exact replicas of the donor tadpole. This opens up the possibility of cloning human beings themselves by the same process.

Cloning is asexual reproduction. A male and a female need not unite to produce an offspring. But in cloning, a cell from a male will only produce a male and vice versa. This handicap is compensated by the fact that the offspring would be an exact replica of the donor.

39. PLASMIDS

The unravelling of the genetic structure has enabled biologists to synthesise artificial genes and to combine the genes of one species with those of another and produce hybrid genes. This technique, known as Genetic Engineering, has received a boost from the discovery of plasmids.

Plasmids may be regarded as auxiliary genetic units, as opposed to chromosomal genes which are the primary units. Plasmids are found most commonly in bacteria and less often in the higher organisms. It is part of the cell but not a necessary part, that is to say, a cell can function fully in the absence of the plasmids. But plasmids can function only in a cell. So plasmids are considered subcellular organisms.

Plasmids resemble viruses in many respects but are essentially different organisms. Viruses are composed of a molecule of nucleic acid (DNA or RNA) wrapped up in a protein coat. Plasmids are made of double stranded DNA molecules which contain a few genes linked together in a small circle. Unlike the viruses they have no protective protein coating. Another vital point of difference is that while plasmids can reproduce themselves without the assistance of the cell, viruses can only reproduce through the medium of the host cells. But the

lies in the roles they play in the life of the cell. A virus is a predator who uses the host cell for its own reproduction and in the process destroys it. A plasmid, on the other hand, does not harm the cell in any manner. On the contrary, it helps the cell by providing it with accessory genetic traits which the cell's own chromosomal genes do not possess.

Fewer in number. Plasmid genes are not basically different from chromosomal genes though they are much fewer in number. Both genes encode for proteins that are active enzymes and both use the same metabolic process to synthesise the proteins. Plasmid genes score over chromosomal genes in one respect. Chromosomal genes can only combine with identical or very similar genes which are their variants (or *alleles*, as they are called). Plasmids can combine their genes with altogether dissimilar genes.

Plasmids are responsible for a wide range of biological activities in bacteria but their

most intensively studied attribute is the R factor (Resistance factor) particularly to antibiotics. This is not unique to plasmids since mutation in chromosomal genes can also endow them with Resistance factors. However, since mutations are rare among chromosomal genes, they do not ordinarily, engineer such resistance. In plasmids this activity is commonplace.

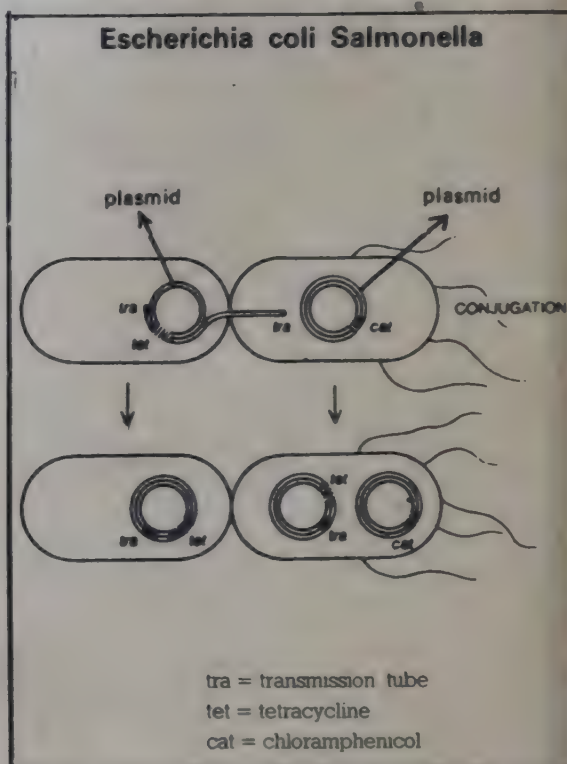
Plasmids adopt different strategies to immobilise substances which are toxic to them and these include antibiotics. The first strategy is *outright destruction* of the toxic elements. This is what happens to drugs like penicillin, streptomycin and mercury compounds. A second strategy is *blocking* the access of antibiotics to their particular targets in the cell. This is often the case with antibiotics like erythromycin which act by binding themselves to the organelles concerned.

A third strategy is a *bypassing* process, that is, substituting an enzyme which does the same function as the antibiotic but is not affected by (remains immune to) the antibiotic drug. This is what happens in the administration of sulfa drugs, trimethoprim and others.

Genetic Variation. When it is seen that bacteria or viruses which initially succumbed to antibiotics subsequently developed resistance, it is clear that some genetic variation must have occurred in the bacteria or virus. Such variations can occur both in the chromosomal and plasmid genes either by mutation, that is a change in the structure of the genes which occurs naturally or by a re-arrangement of the genes. The rearrangement may take place either by a new gene joining up or by a re-shuffling of the old genes themselves.

Such a re-combination of genes and consequent genetic variations are universal among higher organisms who reproduce sexually and have many chromosomes and innumerable genes. But in bacteria which possess only one chromosome and which reproduce themselves by simply dividing into two, such re-combinations are neither easy nor common.

As the bacteria have only one chromosome, different alleles of the same gene are not normally present in a single



cell. The re-shuffling of bacterial gene therefore ordinarily calls for the introduction into the bacterium of DNA molecules that carry alleles from another bacterium.

The plasmid genes have an edge over chromosomal genes in this matter. The chromosomal genes can combine with the alleles (variants) only while plasmid gene can combine not only with their alleles but also with entirely different genes. This makes it easy for plasmids to acquire resistance to a number of antibiotics by combining with a number of other antibiotic resistant genes.

Genetic Mixes. There are three ways in which plasmids may effect genetic mixes leading to genetic variations.

Transduction. This happens when a virus infects a cell and carries fragments of the DNA of that cell into other cells which infect later. 2. **Transformation.** This occurs when a DNA released by the death of the cell or some other natural process simply enters a new cell by piercing the cell wall.

Conjugation. This takes place when a cell transfers some of its genes by sending out a tube into the recipient cell. This is the commonest way in which plasmids achieve genetic variation.

As an instance, let us take the common intestinal bacterium *E. coli* (*Escherichia coli*) carrying a *tetracycline* resistant gene and *Salmonella*, a bacterium associated with food poisoning which carries a *chloramphenicol* resistant. Coming together the *E. coli* plasmid sends out a tube into the *salmonella* plasmid. The tetracycline resistant in *E. coli*

is transferred through this tube into the *Salmonella* plasmid. This would make the *Salmonella* plasmid resistant to both tetracycline and chloramphenicol. In an

environment containing both antibiotics *E. coli* would die but *Salmonella* would thrive resisting both antibiotics. (see illustration).

40. RE-COMBINANT DNA

As biologists learned more and more of the genetic code, they started investigations to see if the code can be permanently changed by manipulating the genes. All attempts in this regard have been collectively categorised as Genetic Engineering.

Genetic Engineering includes fusions, deletions, inversions and transpositions of genes. The most celebrated of all these attempts is the hybridisation of genes, that is grafting a piece of the DNA of one organism to the DNA of another. Research in this technique, briefly known as *Re-combinant DNA*, was facilitated by the discovery of the plasmids and of certain enzymes.

Pioneer attempts in this direction have been so successful that the technique has emerged as a commercial proposition. *Time* writes that this technique promises to be "*the technology of the 1980s just as plastics were in the 1940s, transistors in the 1950s, computers in the 1960s and micro-computers in the 1970s*".

The technique involves micro-surgery. Precision tools for this surgery are provided by certain enzymes which Paul Berg calls molecular scalpels and sutures. One of these enzymes called Restriction Enzyme can cut the DNA at any specific point required and graft it on to a foreign DNA. The sliced-out gene must have sticky ends shaped like mortises in order to anneal it firmly to the foreign DNA. This is also done by the Restriction Enzyme. Given these conditions it is possible to re-combine DNAs as diverse as those of a bacterium and an animal.

Grafting DNA. The first successful attempt at grafting a piece of DNA to a foreign DNA was made by Paul Berg of Stanford University. He took his initial supply of DNA from a well known laboratory organism *SV 40* (short for simian virus 40). Its

genetic structure is fairly simple with about 7 genes in all, compared to the thousands of genes that crowd the cells of higher organisms. To insert this genetic material into a bacterium, Berg used as his carrier (vector) another variety of virus called the *lamda phage*, which preys on bacteria.

The first step in the operation was to cut out a slice of *SV 40*'s DNA molecule. This was done by the use of Restriction Enzyme. As the enzyme cut the double-stranded DNA, it left one strand jutting out at both ends. These were sticky ends and were to be inserted into the foreign DNA which was similarly cleaved with one strand standing out at each end. When the cut ends were put together the single strands joined up to become double strands and the cleavage in the DNA ring was closed up. When this was done Berg had achieved a scientific first -- combining the DNAs of two species of virus into a single DNA molecule (See **Fig**). Berg shared the 1980 Nobel Prize for Chemistry for this achievement.

The process of re-combination is as follows: An *E. coli* bacterium is broken up by a detergent and the pieces are spun in a centrifuge to isolate the plasmids. The plasmid is then immersed in a restriction enzyme which cleaves the plasmid at the specified place. The same enzyme is used to snip off a piece of DNA from a virus. The foreign gene (from the virus) is inserted into the cleavage of the bacterial plasmid and a re-combined molecule is formed. The new hybrid plasmid is then introduced into a

bacterium. The bacterial cell divides and with it the plasmid also divides and multiplies (see *Fig.*).

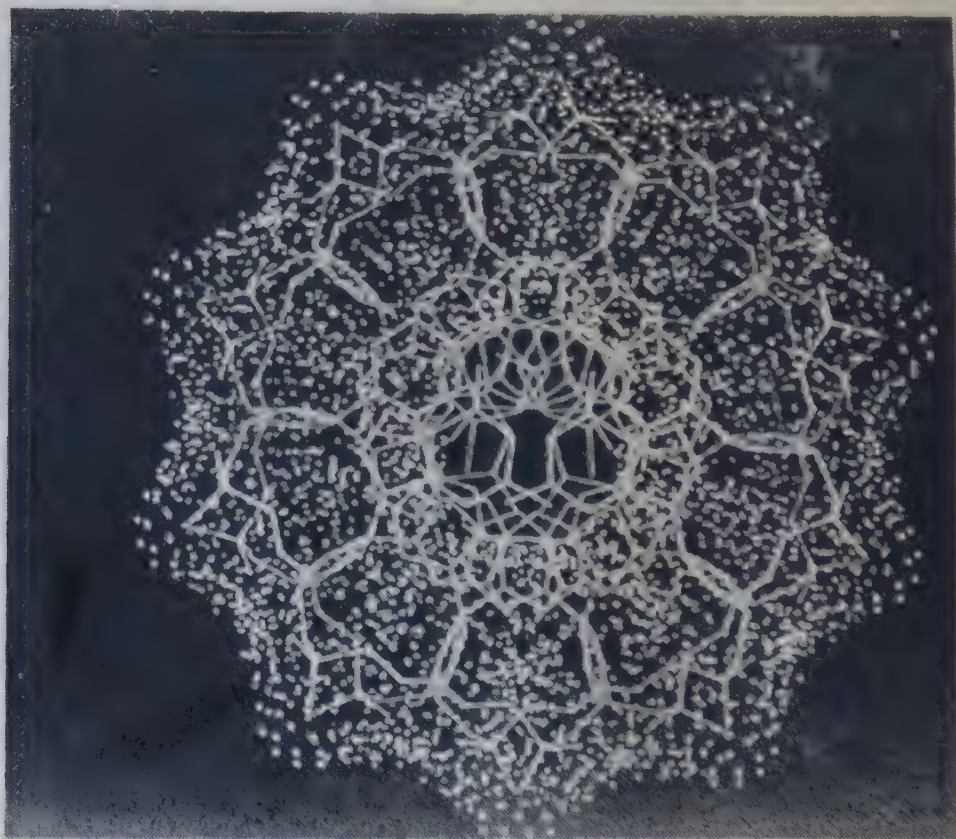
"Gene splicing," says Time, "is the most powerful and awesome skill acquired by man since the splitting of the atom. It is an unparalleled exploratory tool for examining and in the process changing, the complicated machinery of heredity. If a gene of unknown function is inserted into a bacterium, it can act as a probe that lets scientists see precisely what it does. By such techniques researchers will finally speed up the formidable task of identifying, locating and analysing every one of the more than 100,000 genes found in the human cell".

Scope of the Technique. The Recombinant DNA technique opens out many avenues of beneficial research. First comes the production of therapeutic proteins

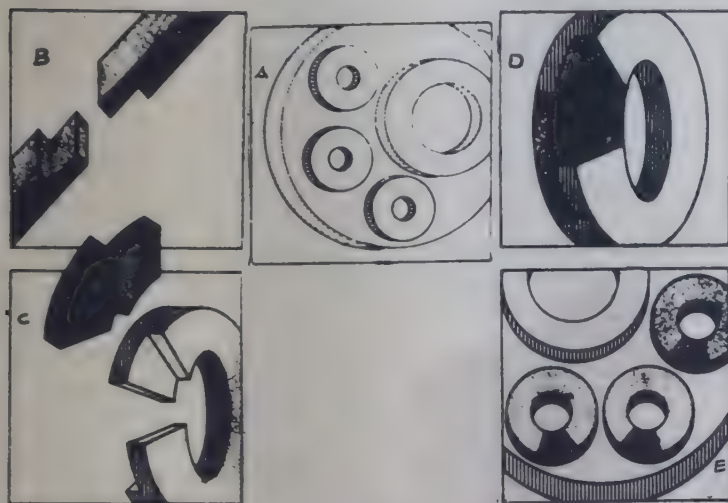
like interferon, insulin, hormones etc. Interferon is a powerful antiviral agent made by the human body. But its supply is very limited considering the demand. Its extraction from blood cells and other human tissues is costly too. A single injection of interferon costs as much as 150 dollars. If, however, bacteria can be programmed to produce it (as has been done by Weismann early in 1981) the supply of interferon would be plentiful and cheap, coming down to a maximum of 1 dollar per shot. The reason is that as a manufacturing unit bacteria are unrivalled.....Mechanical assembly lines, however sophisticated, can never compete with them. Replicating every 20 minutes a single bacterium can produce millions of bacteria in 24 hours all of them turning out interferon in unbroken succession.

The same is the case with insulin, growth hormones, vaccines etc. Already genetically

A DNA Molecule: Cross Section



Re-combinant DNA Technique



a) An *E. coli* bacterial cell showing a chromosome and 3 plasmids (b) A piece of DNA from a virus (foreign organism) is sliced off. The severed ends of the foreign plasmid (c) The sliced off foreign DNA (top) and the cut out bacterial plasmid (d) The foreign DNA is glued to the bacterial plasmid and the cleavage closed (e) The bacterial cell with its chromosome and the new hybrid plasmids.

engineered bacteria have emerged as suppliers of scarce drugs like *enzyme urokinase* used to dissolve blood clots and *betaendorphin*, one of brain's own pain killers. The human growth hormone used to treat dwarfism, formerly in short supply, is now being turned out by bacteria tailored to produce it.

The case of insulin is slightly different. Insulin was being extracted from the pancreases of cows and pigs. This was enough supply. But it turned out that some people were allergic to animal insulin. Now, bacteria specially programmed for the purpose are producing insulin which avoids allergies.

41. THE GENETIC CODE

The genetic code like all codes is complicated but once the formula is properly understood, it can be easily decoded. The blueprint of the code is contained in the genes. The genes are made up of DNA (Deoxyribo Nucleic Acid) molecules which, however, do not actively participate in the synthesis of proteins.

The DNA molecules merely issue coded instructions through Messenger RNA (Ribo Nucleic Acid) which passes on the code to Transfer RNA. It is the tRNA (Transfer RNA) working in conjunction with ribosomes that actually process the required proteins. Two groups namely, 4 RNA nucleotides and 20 amino acids participate in the production of proteins.

RNA Nucleotides

Adenine	A
Guanine	G
Cytosine	C
Uracil	U

Nucleotides. Nucleotides are made up of purine (adenine or guanine) and pyrimi-

dine (cytosine, thymine or uracil) bases and are attached to a carbon sugar and phosphate strand. These are bonded together into a single unit – the nucleotide. The nucleotides of DNA and RNA are similar, except that uracil replaces thymine in the RNA. The nucleotides show a peculiar tendency, that is, A will combine only with T and vice versa while C will combine only with G and vice versa. In the RNA C combines with U instead of G as in the DNA.

Amino Acids. There are 20 different amino acids which are required in processing proteins. They are given below:

The 20 Amino Acids

Alanine	Ala
Arginine	Arg
Asparagine	Asn
Aspartic acid	Asp
Cysteine	Cys
Glutamine	Gln
Glutamic acid	Glu
Glycine	Gly
Histidine	His
Isoleucine	Ile
Leucine	Leu
Lysine	Lys
Methionine	Met
Phenylalanine	Phe
Proline	Pro
Serine	Ser
Threonine	Thr
Tryptophan	Trp
Tyrosine	Tyr
Valine	Val

Codons. How are the 4 RNA nucleotides (AGCU) and the 20 amino acids put together so as to form a code? If A, G, C and U are treated as letters of a code only 4 amino acids will figure in the decoded version. But there are 20 amino acids and all of them have to be provided for in the code. How can this be done?

Strange though it seems, the solution to this problem was first suggested by a physicist-astronomer, George Gamov. He said that if three letters out of four are formed into triplets, 64 different code words can be spelt out. These would accommodate all the twenty amino acids and more. In fact, the problem was how to account for the excess

code words. Subsequent work by biochemists proved the intrinsic validity of the solution, though it happened that some amino acids often got more than one code word to signify them. The triplets thus formed came to be technically termed *Codons*.

Sixty-one out of the 64 codons specify amino acids. In many cases, the same amino acid is represented by several different codons. Indeed, some amino acids have as many as 6 codons each, some get 4, some others 2 and only a couple or so get just one codon each. The remaining 3 codons (64-61) signify full stops to indicate that the making of the protein is completed.

The following codons and their corresponding amino acids may be considered illustrative. UUU=Phenylalanine, GUU=Valine, AUU=Asparagine, GAA=Glutamic acid, GAU=Aspartic acid, UUA=Leucine, UGU=Cysteine, GGU=Glutamine, AGU=Serine. All these acids linked together in the stipulated order form a specific protein.

The Code. The complete code carried by the RNA is depicted below in the form of a chart. Vertical columns (1) and (3) show the related nucleotides. Lateral column (2) shows the nucleotides at the top and the amino acids indicated by them below.

Key Chart

(1)	(2)				(3)	
	U	C	A	G		Remarks
U	Phe	Ser	Tyr	Cys	U	Col 1.
	Phe	Ser	Tyr	Cys	C	read
	Leu	Ser	Stop	Stop	A	vertically
	Leu	Ser	Stop	Trp	G	Col 2.
C	Leu	Pro	His	Arg	U	read
	Leu	Pro	His	Arg	C	laterally
	Leu	Pro	Gln	Arg	A	Col 3.
	Leu	Pro	Gln	Arg	G	read
A	Ile	Thr	Asn	Ser	U	vertically
	Ile	Thr	Asn	Ser	C	
	Ile	Thr	Lys	Arg	A	
	Met	Thr	Lys	Arg	G	
G	Val	Ala	Asp	Gly	U	
	Val	Ala	Asp	Gly	C	
	Val	Ala	Glu	Gly	A	
	Val	Ala	Glu	Gly	G	

Sample reading C (left); A (top) and G (right); code for Gln (glutamine).

Proteins. All proteins are long chains of amino acids linked together in the order prescribed by the code. They are tailor-made for specific purposes. The long chain of amino acids is always found curled up in the form of a ball. The curliness is critical. It identifies the protein. The bumps and clefts on the surface of the ball indicate its specific individuality just as the facial features of a man do.

The RNA bears special markers on its surface to show where the code for the protein begins and ends. These are why there are punctuation codons, which do not stand for any amino acid.

Decoding. The gene made up of DNA molecules is the custodian of the code. It transmits the code imprinted on the Messenger RNA (mRNA) which in turn transcribes the code on the Transfer RNA (tRNA). The RNA carries the identities of the amino acids which are to be put together in the coded order to form proteins. This important work is performed by the ribosome which decodes the RNA message, picks up the required amino acids in the stipulated order and makes the necessary protein. The process is indicated in the chart below.

The process shown in the table may be briefly described thus: The DNA code AAA transmitted as the RNA code UUU is translated to indicate the amino acid

Jumping Genes

Jumping or transposons are called by various names – transposable elements, translocatable elements, movable or mobile sequences, and insertion elements. These are discrete DNA sequences capable of inserting themselves at many different sites on a chromosome (see Genes). These are, in fact, nomadic inhabitants of the subcellular world who move over to new premises without leaving their old tenements. Actually what happens is that they plant an extra copy at a new site while returning the original copy to the initial site.

Transposons are normal constituents of bacterial chromosomes, plasmids and bacteriophages. They are genetically and physically well defined DNA sequences which do not change in character as they move from one place to another. This mobility enables them to effect rearrangements of chromosomal segments and modify genetic activity. Their activities may therefore affect heredity, immunity and other genetic characteristics. But since they are viable to genetic engineering they may be made to yield beneficial results.

Phenylalanine and so on. A string of such amino acids forms the required protein.

Decoding Process

DNA Code	*G	AAA	CAA	TTA	CTT	CTA	AAT	ACA	CCA	TCA	**T
mRNA Transcription	C	UUU	GUU	AAU	GAA	GAU	UUA	UGU	GGU	AGU	A
Protein Translation		Phe	Val	Asn	Glu	Asp	Leu	Cys	Gly	Ser	

* C & G Signals for beginning the making of proteins.

** T & A Signals for stopping.

42. TEST TUBE BABIES

World's first Test Tube Baby, Louise Joy Brown, is seven years old now. Born to Lesley and Gilbert Brown of U.K. on July 25, 1978, the baby girl soon became the darling of millions, opening new hope for couples suffering from infertility around the world.

Birth of Louise was the successful culmination of the bold and painstaking experiments

of Robert Edwards and Patrick Steptoe - a Scientist and Doctor team in close collabora-

tion. Soon after, India announced the birth of another baby girl Durga, as a result of the world's first frozen embryo transfer under the supervision of Dr. Subhas Mukerjee of Calcutta. China reported the success of developing its first test-tube human embryo at the genetic engineering research department of Beijing Medical University on September 21, 1985.

World-wide: While the ethical debate continues, Medical world has been reporting test tube births world-wide, almost routinely and Treatment Clinics sprung up in many countries in the East and the West.

There have been many pairs of test tube twins and also test tube triplets. Louise Brown herself got a test tube baby sister, Natalie Jane, born in 1972.

The first test tube quadruplets were born in Australia in January 1984 and Belgium reported another one in July 1985.

Brussels, St. Peter Hospital said that three embryos had been implanted into the mother's womb in the hope that at least one would develop. But all the three succeeded and one even separated into twins.

In Melbourne Hospital, quadruplets, all boys, were born to a woman who had been trying for ten years to have a child. The boys were named Sam, Christopher, Ben and Brett.

No New Idea: Test tube babies or the production of babies in the laboratory is not a new idea. What is involved here is an artificial method of fertilisation. The ovum of a woman is taken out and is fertilised by the sperm of a male in a test tube. The fertilised ovum is then implanted into the womb of the woman, who supplied the ovum. The fertilised egg attaches itself to the womb and completes its period of gestation within the womb in the normal manner and is delivered in the normal course.

Here, there is very little interference with the natural process—the only difference being that the ovum is fertilised outside the womb (in a test tube) instead of in the fallopian tube of the woman concerned. Socially also, there is nothing reprehensible in this sort of reproduction, so long as the ovum is fertilised by the sperm of the husband.

Complications: Social, ethical or legal complications set in when the woman involved is unmarried or when the ovum is fertilised by the sperm of any male other than the husband of the woman. If the woman is unmarried there is the question of paternity or who the father is, and consequential problems.

Similar difficulties arise if the ovum of a woman is fertilised by the sperm of any man other than her husband. It may also happen that the ovum of one woman, fertilised by the sperm of an unknown male, is implanted in the womb of another woman who brings forth the child. This is an extreme case where there will be two mothers for the same child and may be two fathers.

In the case of an unmarried woman or a married woman whose ovum is fertilised by the sperm of any person other than her husband, the name of the donor of the sperm will not be revealed either to the woman herself or to any others. Similarly, the donor of the sperm will never know whose ovum he has fertilised. At least, this is one of the conditions the doctors insist upon, for obvious reasons. Legal complications apart, such revelations will be highly embarrassing to all concerned.

First Success: However, it was none of these difficulties which obstructed the production of test tube babies till 1978. The difficulty was that the fertilised ovum, even if planted in the womb of the same woman, will not stay there till the end of the gestation period. It will be thrown out, that is, miscarried.

The Scientist-Doctor team at Oldham, U.K., succeeded against these odds in 1978 and since then hundreds of babies have born of the 'in vitro fertilisation' — the scientific name for the technique. The term 'in vitro' means "in glass", but in America's Norfolk Clinic, fertilisation actually takes place in plastic.

The husband's semen is dropped into the plastic culture dishes - not test tubes as in some countries - where the individual eggs have been incubating. Thus the process of inter-course between the woman's egg and male semen takes place in plastic dishes. Some couples later claim to possess these plastic dishes for sentimental reasons. Thereafter the process is very simple.

The Conception: Within 12 hours, the fertilised egg begins to rearrange itself. Though hundreds of sperm wriggle about an egg in a laboratory dish, only one sperm penetrates to fertilise the egg. The roundish bodies in the centre of the cell, called pronuclei, merge, the chromosomes from the mother and father thus completing the process of conception. The patients have a 20 per cent chance of getting pregnant during the four-week treatment about the same chance other women have during a month of male-female intercourse.

The growth: Two days later the single cell divides into two and then four and is ready to be transferred into the mother. Though all of them cannot penetrate, scores of sperm still cling stubbornly to the outer membrane. The expectant mothers are then advised to lie down undisturbed.

The test tube or plastic dish children, therefore, extract far more effort and expense from the parents and it is wrong to minimise affection or sentimental attachment with them. The whole gambit is to provide the remedy for damaged fallopian tube (arteries) in a woman's body and/or invigorate the eggs with powerful male semen in case of husband's inherent weakness.

Surrogate Mother: There have been instances of parents hiring the services of other women to receive the embryos, bear them, grow them in their womb and deliver

the baby. These mothers are called Surrogate Mothers. Commercial agencies are organising such mothers on fabulous fees.

These are inviting legal and ethical complications as well. Two wealthy parents died in an air-crash in Australia leaving test-tube embryos frozen in liquid nitrogen. Doctors faced the dilemma whether to throw the embryos out or implant them in a surrogate mother so that they can inherit their parents' fortune.

In France, a young widow went to court to establish her right to be impregnated with the sperm deep frozen by her husband shortly before his death.

Dilemma: A great dilemma facing the medical world is whether to permit destruction of excess embryos after impregnating a receiver or allow experimentation with them. One argument is that this is tantamount to destruction of human life. Groups like LIFE, the anti-abortion organization, argue that embryos are entitled to the protection due to any human being.

The legal question is whose child it would be if a surrogate mother leases her womb for nine months for another person. The resulting baby would have no genetic connection with the one who gave birth to the child, but as the law stands, the baby would be hers — illegitimately — and the real parents would have to adopt it.

43. FOOD & NUTRITION

Human diet is not restricted to any special category of food. Man can and does eat a variety of foods, of both plant and animal origin. Variety is, for him, the spice of life—more so in foods, than in anything else. This natural desire for variety is justified by the fact that no single food provides us with all the nutrients that we need.

Cereals, like rice or wheat which form the staple food of mankind, supply us only with a fraction of our nutritional requirements. We have to supplement cereals with other foods that provide plenty of fats and proteins and minor quantities of a number of vitamins and minerals. This means that the larger our diet sheet, the better our health will be. This will become evident, if we analyse what nutrients

our foods contain and in what proportion.

The nutrients found in foodstuffs may broadly be classified as (1) Carbohydrates, (2) Fats, (3) Proteins, (4) Minerals, (5) Vitamins and (6) Water. Proteins, fats and carbohydrates are called Macro Nutrients.

Macro Nutrients. Proteins (from the Greek word *Proteios* meaning first) are the

most versatile elements in the body. They are the chief substances of the cells of the body. They form important constituents of muscles and other tissues and vital fluids like blood. Enzymes, which assist in the digestion of food, and anti-bodies which are the body defences against infections are also mainly protein in nature.

The nutritive value of protein depends on the essential *amino acid* composition. Amino acids are the bricks with which tissue protein is built and replaced. There are some 20 amino acids commonly found in dietary proteins. Of these, 10 amino acids can be synthesised by the body itself, whether by mutual conversion among amino acids or from non-protein sources. But 10 amino acids cannot be so synthesised and have to be supplied through diet. These are called *essential amino acids*. Adults require 8 essential amino acids while children require 9 or 10.

Fat, like protein, is a necessary ingredient in diet and is of value to the body in a number of ways. It is a concentrated source of energy and supplies per unit weight more than double the energy furnished by either protein or carbohydrates. Some fats, especially vegetable oils, provide what are called *essential fatty acids*, linoleic and arachidonic acids, to the body.

Cholesterol. Fats that circulate in the blood are of many types - triglycerides, phospholipids etc. The quantity and quality of fat consumed affects the level of *cholesterol* in the blood. Some fats like groundnut oil, sesame oil or safflower oil which contain a high proportion of poly-unsaturated fatty acids do not increase blood cholesterol levels greatly. Others like coconut oil, butter, ghee and hydrogenated vegetable oils (vanaspati) contain high proportions of *saturated fatty acids** and greatly increase cholesterol levels. It is also found that consumption of smaller amounts of fat at different times causes less increase of cholesterol than a large amount of fat taken at a time.

Carbohydrates include every kind of starch and sugar. Grainfoods are largely composed of starch and foodstuffs like cane sugar and glucose are pure carbohydrates.

* Saturated means that the fat molecule contains all the hydrogen atoms that it can hold. Unsaturated and poly-unsaturated oils (mostly vegetable oils) have room in the molecules for additional hydrogen atoms.

Protein Value of Indian Foods

Foodstuffs	Biological value	Protein efficiency ratio
Rice	68	2.2
Wheat	65	1.5
Maize	59	1.2
Bengal gram	68	1.7
Red gram	57	1.5
Groundnut	55	1.7
Gingelly seeds	62	1.8
Egg	94	3.9
Milk	84	3.1
Meat	74	2.3
Fist	76	3.5

They form the main source of energy for the body. Being a cheap source of energy, carbohydrates form the bulk of Indian diet.

A balanced diet simply means a diet that will supply all the nutrients necessary for the growth and development of the body. In India, a balanced diet has become an imperative since most Indians consume foods that provide more carbohydrates and fats than proteins.

The table below gives the amounts of the various foods that will make up a balanced diet for the average Indian. The quantity of food varies according to age and the type of work.

Composition of Balanced Diet

Foodstuffs	Vegetarian		Non-Vegetarian		Non-Vegetarian	
	Amount	Gm	Calories	Protein (gm)	Calories	Protein (gm)
Cereals	325	325	1150	29	1150	29
Dal & Nuts	100	50	320	22	160	11
Milk	200	100	235	8	117	4
	(ml.)	(ml.)				
Root vegetables	150	150	145	2	145	2
Other vegetables	100	100	50	3	50	3
Leafy vegetables	100	100	"	"	"	"
Fruits	100	100	80	-	80	-
Egg	-	50	-	-	85	6
		(1 no.)				
Meat/Fish	-	100	-	-	195	18
Fat	50	50	450	-	450	-
Sugar/Jaggery	30	30	120	-	120	-
Total			2550	64	2552	73

Micro Nutrients. Vitamins and minerals comprise what are called micro nutrients as distinguished from proteins, fats and carbohydrates which are called macro nutrients.

Vitamins can be broadly divided into fat-soluble and water-soluble vitamins. Vitamin **A, D, E** and **K** are fat-soluble vitamins. Vitamin **C** and **B*** (including Vitamins **B₁**, **B₂** and other B-Group vitamins) are water-soluble.

The vitamins are necessary auxiliaries in metabolism*. They combine with specific proteins, as parts of the various oxidative enzyme systems which are concerned with the breakdown of carbohydrates, proteins and fat in the body. Thus, they are intimately involved in the mechanism which releases energy, carbon dioxide and water as the end products of metabolism.

A large number of minerals is present in the body and performs a variety of functions. Minerals account for about 4 per cent of the body weight. Calcium and phosphorus form about three-fourths of the mineral elements. Five other minerals – potassium, sulphur, sodium, chlorine and magnesium – account for most of the rest. Many elements are present in such minute quantities that they are called *trace elements* or *micro-nutrients*.

Major Elements. Among the major elements calcium, potassium, sodium and magnesium when dissolved in water function as cations (pronounced cat-ions) and phosphorus, sulphur and chlorine as anions (pronounced an-ions). Cations are positively charged ions, that is, they are deficient in electrons and anions are negatively charged ions, that is surplus in electrons. These seven ions maintain the electrical neutrality of body fluids and cells and also play a part in maintaining the proper liquid volume of the blood and other fluid systems.

Calcium is the most abundant mineral in the human body, 99 per cent of which occurs in the bones and teeth and one per cent in the blood, other body fluids and soft tissues.

* Metabolism represents the chemical processes going on in living organisms. It involves two activities

1 Catabolism, which reduces complex substances into simple ones, and releases energy, and

2 Anabolism, which comprises the building up of complex substances from simple ones. Metabolic reactions are mainly controlled by enzymes.

Calcium aids in blood coagulation, activation of some enzymes and normal responses to nervous stimuli. Vitamin D is concerned with the optimum absorption of calcium. **Sources:** Milk, cheese, egg, green vegetables, especially amaranth, fenugreek and drumstick leaves and tapioca.

Phosphorus: Eighty per cent of phosphorus is combined in the bones with calcium, the rest is in the soft tissues of the body. Phosphorus acts as a constituent of enzymes in the metabolism of carbohydrates and fats. It is a regulator of acid-base balance in blood and a transporter of fatty acids. In the form of *adenosine triphosphate (ATP)* it supplies energy for muscle contraction. **Sources:** Liver, kidney, egg yolk, meat, fish, milk, cheese, cereals.

Potassium occurs primarily within the cell, muscles and red blood cells containing most of it. Potassium is essential, along with other minerals, in the contraction of the muscles, regular heart rhythm, the conduction of nerve impulse and maintenance of fluid balance. **Sources:** Meat, fish, fowl, cereals, fruits and vegetables.

Sulphur is found mainly as a constituent of two amino acids, *cystine* and *methionine*. Cystine is important in skin, hair and nails. Methionine is important in the synthesis of adrenalin (product of adrenal glands) and creatin (a crystalline compound present in the muscles). **Sources:** Eggs, cheese, milk, meat, nuts and legumes.

Sodium is mainly found in blood plasma and in inter-cellular fluid. It functions as a regulator of acid-base equilibrium, osmotic pressure, water balance, muscle contraction and nervous irritability. **Sources:** Table salt, baking soda, baking powder, meat, milk and eggs.

Chlorine occurs as *sodium chloride* in the inter-cellular fluid and as *potassium chloride* in the cell. It is a constituent of stomach acids, acts as acid-base balance and regulates osmotic pressure. **Sources:** Table salt, meat, milk, eggs

Magnesium. Seventy per cent of magnesium is found in the form of phosphates and carbonates in the bones; the rest in the muscles. It functions in collaboration with sodium, potassium and calcium in the regulation of cardiac, skeletal

muscles and nerve tissues. *Sources:* Cereals, nuts, legumes, meat and milk.

Minor Elements: **Iron:** About 70 per cent of iron is in the form of haemoglobin in blood, 4 per cent as myoglobin in the muscles, 25 per cent in liver, bone marrow, spleen and kidneys and 1 per cent in plasma, iron and oxidative enzymes.

Traces of copper are necessary for the conversion of iron into haemoglobin. As red blood cells die, the iron contained in them is reclaimed by liver and spleen and put back into new blood cells. About 27 to 28 mg of iron is thus reclaimed daily and put back into use. *Sources:* Liver, meat, egg yolk, raisins, peas, fish, whole grains, green vegetables.

Manganese aids in thyroxine formation, formation of urea, and activation of enzymes. *Sources:* Whole grain, cereals, legumes, leafy vegetables, meat, fish and fowl.

Copper helps in absorption and metabolism of iron, oxidation of fatty acids, metabolism of ascorbic acid (vitamin C) and skin pigmentation. Copper is stored in liver and central nervous system and excreted by bile into the intestines. *Sources:* Liver, shellfish, nuts, legumes, and whole grain cereals.

Iodine: Most of the iodine is found in the thyroid gland and is used in the production of thyroxine. When the tissues use thyroxine, the iodine in it is released. About one-third of the iodine so released is used in the production of new thyroxine. Deficiency of iodine causes *goitre* (a swelling of the throat) and *cretinism* (underdevelopment of mind and physique). *Sources:* Sea foods, iodised salts and iodised sweets.

Trace Minerals are so called because only minute quantities of these minerals are required by the body. But this fact does not in any way diminish their importance. In this aspect, they are comparable to the vitamins.

Among the trace minerals or micro-nutrients, found in living organisms are aluminium, arsenic, barium, boron, bromine, cadmium, cobalt, chromium, lead, molybdenum, nickel, selenium, silicon, strontium, tin, vanadium and zinc.

Water: Water is a vital constituent of diet. An average man contains about 45 litres of water (70 per cent of the body weight). The

cells contain 30 litres. Three litres are in the plasma of the blood, where the suspended cells make a total volume of blood upto 5 litres. The remaining 12 litres (45-33) fill the spaces between groups of cells. This is tissue fluid which bathes all the cells of the body.

Water is absolutely necessary for the digestion and absorption of the foods taken in. It is the great solvent and neutraliser in the body. It is the substance in which bodily chemical reactions take place. Water is the carrier or transporting medium for all nutrients and body substances. It regulates body temperature. It is the great purifying agent in the body and removes waste materials in the form of tears, perspiration, urine and faeces. Watery substances act as lubricants in the body, especially in the joints. It is a part of all body tissues and fluids.

Acidosis, alkalosis and dehydration, oedema fever, shock, uraemia, and constipation are some of the clinical signs of inadequate salt and water in the body. *Sources:* The body obtains water mainly from the fluids we drink, from the solids we eat and also from the oxidation of energy foods. Fats and carbohydrates are oxidised in the body to carbon dioxide and water.

Nutrient Values. Cereals like rice, wheat and millets, ragi, cholam and bajra form the main food in India. Cereals are rich in carbohydrates. They generally contain 6 to 12 per cent protein, but these proteins are usually deficient in the essential amino acid *lysine*. Rice protein, however, is richer in *lysine* than other cereals.

Most cereal grains are poor in mineral content and rice is especially poor. Ragi is, however, rich in minerals, especially in calcium, and bajra in iron. Whole cereal grains are important sources of B-vitamins but in milling, rice loses the outer layers containing thiamine. Parboiled rice, even when milled, does not lose its thiamine content. Except yellow maize, which contains some amounts of carotene, no other cereal grain is a source of vitamin A or C.

Pulses or legumes as they are called, are rich in proteins. Pulse proteins, however, are of relatively low biological value because of the deficiency of the essential amino acid *methionine* but they are rich in *lysine*. Pulses are not rich sources of minerals but they are

Some Indian Food-Values

Values given are per 100 gm of edible portion.

Name of food stuff	Protein gm	Fat gm	Minerals gm	Carbohydrates gm	Energy Kcal
Cereals					
Jowar	10.4	1.9	1.6	72.6	349
Maize, dry	11.1	3.6	1.5	66.2	342
Rice, parboiled, milled	6.4	0.4	0.7	79.0	346
Rice, raw, milled	6.8	0.5	0.6	78.2	345
Wheat (whole)	11.8	1.5	1.5	71.2	346
Wheat flour (maida)	11.0	0.9	0.6	73.9	348
Pulses and Legumes					
Green gram (whole)	24.0	1.4	3.5	56.7	334
Khesari dhal	28.2	0.6	2.3	56.6	345
Peas, dry	19.7	1.1	2.2	56.5	315
Soya beans	43.2	19.5	4.6	20.9	432
Leafy Vegetables					
Amaranth, tender	4.0	0.5	2.7	6.1	45
Araikeerai (cheera)	2.8	0.4	2.4	7.4	44
Cabbage	1.8	0.1	0.6	4.6	27
Drumstick leaves	6.7	1.7	2.3	12.5	92
Roots and Tubers					
Carrot	0.9	0.2	1.1	10.6	48
Potato	1.6	0.1	0.6	22.6	97
Tapioca	0.7	0.2	1.0	38.1	157
Yam, elephant	1.2	0.1	0.8	18.4	79
Other Vegetables					
Bitter gourd	1.6	0.2	0.8	4.2	25
Brinjal	1.4	0.3	0.3	4.0	24
Cauliflower	2.6	0.4	1.0	4.0	30
Cucumber	0.4	0.1	0.3	2.5	13
French beans	1.7	0.1	0.5	4.5	26
Lady's finger	1.9	0.2	0.7	6.3	35
Nuts & Oilseeds					
Almond	20.8	58.9	2.9	10.5	655
Cashewnut	21.2	46.9	2.4	22.3	596
Coconut, fresh	4.5	41.6	1.0	13.0	444
Groundnut	25.3	40.1	2.4	26.1	567
Fruits					
Amla (Nellikka)	0.5	0.1	0.5	13.7	58
Banana, ripe	1.2	0.3	0.8	27.2	116

Lime	1.5	1.0	0.7	10.9	59
Mango, ripe	0.6	0.4	0.4	16.9	74
Orange	0.7	0.2	0.3	10.9	48
Papaya, ripe	0.6	0.1	0.5	7.2	32
Pineapple	0.4	0.1	0.4	10.8	46
Tomato, ripe	0.9	0.2	0.5	3.6	20

Fish

Promfrets, white	17.0	1.3	1.5	1.8	87
Prawn	19.1	1.0	1.7	0.8	89
Sardine	21.0	1.9	1.7	-	101
Shrimp (small dried)	68.1	8.5	17.4	-	349

Meat

Beef muscle	22.6	2.6	1.0	-	114
Egg, hen	13.3	13.3	1.0	-	173
Fowl	25.9	0.6	1.3	-	109
Goat meat	21.4	3.6	1.1	-	118
Pork, muscle	18.7	4.4	1.0	-	114

Milk and Edible Oils

Milk, cow	3.2	4.1	0.8	4.4	67
Curds	3.1	4.0	0.8	3.0	60
Cheese	24.1	25.1	4.2	6.3	348
Ghee (cow)	-	100.0	-	-	900
Hydrogenated Oil (vanaspati)	-	100.0	-	-	900

Source: National Institute of Nutrition-ICMR-Hyderabad, India.

rich in B-vitamins. Dried pulses do not contain vitamin C but if they are germinated significant amounts of vitamin C are generated.

Leafy Vegetables. Most of the green leafy vegetables are rich sources of calcium, iron, carotene, vitamin C, riboflavin and folic acid.

Roots and tubers are rich in carbohydrates. But foods like carrot are also rich in carotene (Vitamin A); those like potato contain significant amounts of vitamin C, while foods like tapioca contain calcium also.

Other Vegetables are those which do not fall into the category of leafy vegetables or root vegetables. These vegetables are shoots, like lady's finger, cucumber, tomato, bitter gourd, snake gourd, brinjal, etc. They are fairly good sources of vitamins and minerals.

Nuts and oil seeds are good sources of fat (oil), protein and minerals and fair sources of vitamins: eg., groundnut and cashewnut.

Fruits in general are rich in vitamin C

particularly, gooseberry (amla), guava (perakka) and citrus fruits. Yellow fruits like mango and papaya contain carotene and dried fruits like dates are sources of iron.

Fish and sea foods are rich sources of protein, B-vitamins and also minerals, especially calcium.

Fleshy foods are rich sources of protein and B-vitamins, especially B₁₂. They are generally deficient in vitamin A, but liver is an exception.

Egg is a rich source of all nutrients except vitamin C. Its protein is of high quality.

Milk & milk products. Milk is an ideal food for infants and young children and a good supplementary food for all. It contains all vital nutrients, except vitamin C and iron.

Food & Energy. Food is the only source of energy for humans. This means that our dietary sheet must change according to our requirements of energy. "If food is to perform the functions in the body it is meant to, namely producing energy, providing materials for body building, and regulating body processes, meals must be planned.

Good food selection, the cornerstone of good nutrition, must be learned as unfortunately there is no automatic built-in mechanism in human beings to direct the choice of foods which build healthy bodies and which keep them running satisfactorily from day to day."

The question what food we should eat and how much, depends on the amount of energy we need. Food energy is measured in terms of heat units called calories. A physiological calorie, also called large calorie or kilocalorie (abbreviated as Kcal), is the amount of heat necessary to raise the temperature of one kilogram of water by one degree centigrade. One gram of protein or carbohydrates yields 4 calories. One gram of fat yields 9 calories while the same quantity of alcohol yields 7.

Basal Metabolism. There is an irreducible minimum of energy expenditure, without which life is impossible. The absolute minimum is reached when one is asleep. For practical purposes, however, measurement is taken when the subject is awake, lying quiet, comfortably warm and relaxed, 12 to

15 hours after the last meal. This is known as *Basal Metabolism*. This represents the rock bottom energy necessary for survival (see Energy Cycle, *Biosphere*, supra).

Taking the calorie consumption of an average adult male doing sedentary work as 1, the calorie requirements of others work out as under:

Adult male (sedentary worker)	1.0
(moderate worker)	1.2
(heavy worker)	1.6
Female (sedentary worker)	0.8
(moderate worker)	0.9
Adolescents (12-21 years)	1.0

Obesity. Obesity means an excessive accumulation of body fat. This results from the intake of more calories than the body can utilise. The excess calories are then stored as fat or adipose tissues. Generally the term *overweight* applies to persons whose weight is 10% more than the standard weight in terms of sex, age, height and weight. *Obesity* is gross overweight and refers to an excess of 20% more than the average weight for the population group.

The essential cause of obesity is the intake of calories in excess of metabolic requirements. Of course, heredity has a great deal to do with it.

Plastic Invasion

Introduced first by the French in 1795, the glass jar and tin can were unchallenged for packaging food and drinks for two hundred years. Ten years ago came the aluminium can. Now there is an even greater challenge—plastic cans and containers, reports PTI.

The technological leap, say the trade journals, is the development of barrier resins which form a spaghetti like lattice of polymers too tight for oxygen molecules to squeeze through. Ethylene Vinyl Alcohol is the most common type of resin.

The plastic containers were first introduced in Japan recently.

Each year, it has been estimated, Americans buy 30 billion cans of food and 70 million cans or bottles of soft drink and beer.

The following tables show the height-weight ratio of 1. Adults, and 2. Adolescents

Adults: Height-Weight Ratio							
MEN				WOMEN			
Weight in Kg				Weight in Kg			
Height	Age			Height	Age		
cms	20	35		50	cms	20	35 40
148	42.7	47.6		50.9	148	38.6	44.0 47.1
153	45.4	50.4		53.5	150	40.3	44.8 47.7
158	48.6	53.5		56.3	153	41.9	46.6 49.5
163	51.1	56.3		59.4	155	42.8	47.7 50.1
168	54.0	60.1		63.7	158	44.9	49.5 52.1
173	58.1	64.0		68.3	160	46.0	50.6 53.0
178	61.9	68.5		72.4	163	47.3	52.1 54.9
183	66.0	73.3		77.8	165	49.1	54.1 57.3

Source: Science Today

Adolescents: Height-Weight Ratio				
Boys			Girls	
Height	Weight	Age	Height	Weight
(cm)	(kg)	(yrs)	(cm)	(kg)
112.4	19.2	5+	112.5	18.6
118.8	21.9	5+	117.8	20.5
123.2	24.3	7+	123.2	23.8
127.9	26.1	8+	127.2	26.0
133.3	29.2	9+	132.5	29.0
138.0	31.0	10+	138.2	32.6
142.7	34.0	11+	145.1	36.3
148.4	37.8	12+	151.5	42.5
155.0	42.4	13+	153.8	43.9
162.6	47.3	14+	154.5	45.0
165.5	51.1	15+	155.8	47.3
168.9	54.8	16+	155.8	49.0

Source: Imprint

44. LANDMARKS OF SCIENCE

Science, from the Latin *Scientia*, means learning or knowledge in its widest sense. In English, the word has a restricted application. It generally means physical and biological sciences.

Primitive science can hardly be called science. It was a hotch-potch of superstition, magic and rituals. Nevertheless, this hotch-potch contained elements that were destined to become the foundations of science.

Transition. At first, all natural phenomena—physical and biological—were interpreted as the operations of supernatural powers, which had to be worshipped, placated or appeased by magic rites and practices.

This primitive conception was refined and developed by the old world philosophers from Aristotle (4th cen. B.C.) to Aquinas (13th cent. A.D.). These philosophers eliminated much of the superstitious dross that had accumulated, but they could not dissociate science from metaphysics or religion.

The Greek philosophers, Aristotle in particular, considered science and philosophy as one and the same. In the Middle Ages both science and philosophy had become bound up with theology. Aquinas, the greatest of the scholastic philosophers, regarded all the three subjects as parts of one grand system of philosophy.

Modern Science. It was left to Galileo to break up this misalliance and to strike out a new path for science—the path of experimental proof. This method initiated by Galileo was completed by Newton, and modern science was born. The essence of the new method was an appeal to sheer facts for proof.

In India too, science grew up from religion. The scientific lore of the Indus Valley people must have been very large, judging from the high degree of civilization they had attained. But we know little or nothing about them. With the coming of the Aryans, we get our first glimpses of science in India.

Theories and Principles of major scientific breakthroughs are given below in chronological order. A stands for Author and T for Treatise. The letters A and/or T are shown only in places where the names of the author and the treatise are mentioned together or where there is a chance of mistaking one for the other.

Yajurveda (T), c. 1000 B.C., India—Numbers named up to 10^{12} (million-million)—

Atom Smasher

In a project researchers herald as the biggest and costliest pure science project in history, scientists have taken the first major step towards building an atom smasher so big it would encircle New York city.

The scientists yesterday announced the selection of a key element of the machine, a type of superconducting magnet meant to keep speeding subatomic particles locked in a magnetic prison 95 km in circumference.

The machine is expected to cost from + 3 to 6 billion and is to be completed in the mid-1990s. Scientists said the project would rival the great pyramids of Egypt and construction of the Panama Canal.

The decision marks a commitment to a specific design for the huge machine, which would be the world's most powerful device for probing the heart of the atom and solving some of the long-standing enigmas of the scientific world.

[AP: Sep 19, 1985]

decimal system, addition, subtraction, multiplication, division, fractions. *Astronomy*—the Nakshatra (stars and constellations) system. Enumeration of 27 or 28 *Nakshatras* headed by Krithika (Pleiades).

Taittiriya Samhita (T), 800-700 B.C., India—Progressive arithmetical series—odd and even numbers.

Panchavimsa Brahmana (T), 800-700 B.C., India—Geometrical progression.

Satapatha Brahmana (T), 800-700 B.C., India—Summation of arithmetical and geometrical series.

Sulba Sutras (T), 700-600 B.C., India, *Geometry*—Rules for drawing perpendiculars, squares, isosceles, trapezium, etc. Combination and transformation of rectilinear figures.

Lagadha (A). *Vedangajyotisa* (T), 700-600 B.C., India, *Astronomy*.—Elaboration of

calendrical science—summer and winter solstices. Rule for determining length of days between solstices.

Baudhayana (A), 600-500 B.C., India, *Geometry*—anticipation of the Pythagorean theorem—"The diagonal of a rectangle produces by itself both (the areas) produced separately by its two sides." Areas of triangles, parallelograms, trapezium, etc. Volumes of prism, cylinder, etc. The concept of *Algebra*—quadratic equations.

Manava, 600-500 B.C., India—Fixing the value of the π to 5 decimal places at 3.16049.

Apastamba, 600-500 B.C., India—Square root and cube root.

Katyayana, 500-400 B.C., India—Indeterminate Equations.

Kautilya (A) *Arthashastra* (T), 400-300 B.C., India—Mining, metallurgy, etc. incidental references.

Bhadrabahu (A) *Kalpasutra* (T), 300 B.C., India—Summation of geometrical series.

Euclid (A). *Elements* (T), 300 B.C., Greece—The first formal statement of geometrical principles.

Pingala (A). *Chandah Sutra* (T), 200 B.C., India—Permutations and combinations—meru prasta or Pascal's triangle.

Archimedes, d. 209 B.C. 200 B.C., Greece, *Hydrostatics*—the laws of floating bodies.

Aristarchus of Samos (A), c. 200 B.C., Greece—Observations and calculations regarding rotation of the Earth and revolution round the Sun.

Eratosthenes, c. 200 B.C., Greece—First measurement of the circumference of the Earth.

Chiu Chang Suan Shu (T), 2nd Cent. B.C., China *Arithmetic*—in nine sections—area of the segment of a circle.

Hipparchus, 2nd Cent. B.C., Greece—Measurement of the distances to the Sun and the Moon—precession of the equinoxes.

Claudius Ptolemy (A) *Almagest* (T) A.D. 140, Greece—A synthesis of the current system of astronomical knowledge in Europe—remained the Bible of European astronomers for a long time.

Suryasiddhanta (T), A.D. 400, India—The first important astronomical treatise in

India—was continuously revised and updated by subsequent astronomers.

Rotation of Earth. Aryabhata (A) Aryabhata (T), A.D. 5th Cent., India, Astronomy—Theory of the rotation of the Earth, epicyclic theory of planetary motions. *Mathematics*—the values of the π (3.1416) and sines—alphabetical system of expressing decimal place value notation—extraction of square and cube roots—indeterminate equations of the first order.

Brahmagupta (A) *Brahmasphuta Siddhanta* and *Khandakhadyaka* (T), A.D. 6th Cent., India, Astronomy—mean planetary motions, true planetary motions, problems of time, space, distance, lunar and solar eclipses—risings and settings of planets, Moon's cusps and shadows—conjunctions of planets—*Mathematics*—systematic operations with zero.

Varahamihira (A). *Pancha Siddhanta* (T), A.D. 6th Cent., India—A survey of the development of astronomy and an exposition of astronomical theories. Other astronomical works by Varahamihira include *Brahat Samhita*, *Leghujataka* and *Yogayatra*.

Amarasimha (A). *Amarakosha* (T), A.D. 6th Cent., India—A lexicon—classification and synonyms of plants, animals, metals and minerals.

Bhaskara I (A). *Mahabhaskariya* (T), A.D. 7th Cent., India—Mean longitude of planets—Longitude connection—Time, place, direction, spherical trigonometry, latitudes and longitudes of junctions stars—True longitudes of planets, rising, setting and conjunction of planets, astronomical constants.

Muhammed Ibn Ibrahim (A). *Sindhind and Arkand* (T), A.D. 8th Cent., Middle East—Translations into Arabic of Brahmagupta's *Brahmasphuta Siddhanta* (*Sindhind*) and *Khandakhadyaka* (*Arkand*).

Jabir Ibn Hayvan (Geber), A.D. 8th Cent., Middle East—Treatise on alchemy.

Mahavira (A). *Ganitasara Samgraha* (T), A.D. 9th Cent., India—A comprehensive compilation in mathematics including geometry, solid mensuration, quadratic, biquadratic and cubic equations and permutations and combinations.

Al-Khwariszi (T), A.D. 9th Cent., Middle

100,000th Rolce-Royce

Rolls-Royce, builder of the world's most luxurious automobiles rolled out its 100,000th motor car in August, 1985—a royal blue Silver Spur Sedan.

The car with graceful lines that are both classic and modern, has silver picnic tables that fold down for passengers in the rear. Between the front seats is a compartment containing two silver whiskey flasks and four crystal glasses.

The dashboard is made of walnut, and the seats are covered in champagne-coloured leather.

The car is to go on permanent display at the factory beside a 1904 two-cylinder open tourer built in the year that racing driver Charles Rolls and electrical engineer Henry Royce formed their partnership.

The display also will include a 1907 Silver Ghost that is still going strong after having covered more than 500,000 miles as a company demonstrator.

[AP: Aug. 5, 1985]

Fastest, largest Memory

Cray-2, the newest supercomputer with the Lawrence Livermore National Laboratory in California, is believed to be the fastest computer in operation today.

The "C" shaped machine, designed and built by Cray Research of Minneapolis, has the largest internal memory capacity (2,000 million bytes) and a top speed six to twelve times faster than its predecessor, the Cray-I. This is some 50,000 times faster than a personal computer.

The machine's circuit boards are washed by 900 litres of liquid coolant during operation to prevent them from melting under the heat caused by electrons flowing through them.

[USIS, Nov. 1985]

East—Theory of numbers in Arabic.

Zenith of Maths. Bhaskara II (A). Siddhanta Siromani (T), A.D. 9th Cent., India—Mathematical and astronomical work—Beginnings of integral and differential calculus—the zenith of ancient Indian mathematics.

Govinda Bhagat (A). Rasahrydaya (T), A.D. 10th Cent., India—A treatise on alchemy.

Manjula (T), A.D. 10th Cent., India—Astronomical treatise—precession of equinoxes.

Al Hasan, A.D. 11th Cent., Middle East—Arab physicist—Magnification and Refraction of light.

Somadeva (A). Manasollasa (T), 12th Cent., India—Alchemy.

Gangadhara (A). Gandhasara (T), 12th Cent., India—A treatise on cosmetics.

Rasarnava (T). Rasaratnakara (T), 13th Cent., India—Treatises on alchemy.

Leonardo of Pisa (A). Liber Abaci (T), 13th Cent., Italy—An exposition in Latin of Arabic arithmetic including decimal place value numeration, zero etc. This was the main source through which Indian numerals penetrated Europe.

Rasapradipa (T), 16th Cent., India—A treatise on alchemy—one of the many treatises on alchemy prevalent in India.

Modern Astronomy. Nicolas Copernicus, 1543, Poland, Astronomy—Foundation of modern astronomy—heliocentric structure of the solar system.

Georg Bauer (Agricola) (A). De Re Metalica (T), 1556, Germany—Establishment of the Science of Minerals.

Gerhard Kremer, 1559, Netherlands—Cylindrical Projection Map (Mercator's Projection) – Establishment of the Science of Cartography (map making).

Galileo Galilei, 1589–92, Italy – Discovery of the laws of motion – Science of Dynamics.

William Gilbert (A). De Magnete (T), 1600, U.K.—The Earth itself is a great magnet—the basis of Magnetism and Electricity.

Johannes Kepler, 1609–19, Germany—The three fundamental laws of planetary motion.

Propellers Return

When jet planes replaced propeller driven planes in the 1950s, it was considered a great leap forward in aviation. Now, the next major advance in aircraft engine design is a surprising one: a return to propellers. The new engines, known as propfan engines or ultra-high bypass engines, promise a 40-percent to 50-percent savings in fuel over existing jet engines.

Both Boeing Co. and McDonnell Douglas Corp. say that will have planes using such engines on the market in the early 1990s. Boeing is planning to test-fly a propfan engine next year and McDonnell Douglas plans one in 1987. In their tests, both will use an engine developed by General Electric Co. that had its first ground tests two months ago.

"We're banking a tremendous amount of money on the fact that everything looks good so far," said Walter J. Orlowski, manager of McDonnell Douglas's program to develop the propfan plane.

The National Aeronautics and Space Administration is also working on such engines, with Lockheed Corp. as its major contractor, and a test flight using a Gulfstream airplane is scheduled for 1987. Others are also working on the new engines.

Propellers have always been more fuel-efficient than jet propulsion. But jets won out for commercial aircraft because they were faster. Indeed, until the oil price increases of the 1970s, fuel costs were not a concern.

The propfan engine promises to provide the efficiency of propellers in a plane that can travel as fast as jets. Advances in engine and propeller design now make possible propellers that can function at high speeds.

[New York Times: Oct. 11, 1985]

John Napier, 1614, U.K., Logarithms—a new method of arithmetical calculations.

Rene Descartes, 1619, France—Formulation of *Analytical Geometry*.

Francis Bacon (A). Novum Organum (T), 1620, U.K.—First formal exposition of *Inductive Logic*.

Robert Boyle, 1661, U.K.—Distinction between chemical elements and chemical compounds; the Science of *Chemistry*.

Robert Hooke, 1665, U.K.—Hooke's law.

Isaac Newton, c. 1670, U.K.—Discovery of *Calculus*.

Gottfried Leibnitz, 1675-76, Germany—Discovery of *Calculus*.

Olaus Romer, 1676, Denmark—Measurement of the velocity of light.

Leeuwenhoek, 1676, Netherlands—looks into the microscopic world and describes bacteria.

Laws of Gravitation. *Isaac Newton, 1687, U.K.*—Laws of gravitation and Universal laws of motion.

Christian Huygens, 1690, Netherlands—The wave theory of light.

Stephen Gray, 1729, U.K.—Electrical conductors and non-conductors - Insulation.

Joseph Black, 1728-1769, U.K.—Theory of specific heat.

Carolus Linneaus (Karl von Linne) (A). Systema Naturae (T), 1735, Sweden—Foundation of the Science of *Taxonomy*—*Divisions of the plant kingdom*.

Charles Augustine Coulomb, 1736-1806, France—Law of attraction and repulsion of electric charges.

William Herschel, 1738-1822, U.K.—Identification of infrared rays.

Antoine Lavoisier, 1743-1794, France—Founding of *Organic Chemistry*.

C. F. Du Fay, 1753, France - Fundamental law of electric charges - positive and negative.

Johann Ritter, 1776-1810, Germany—Identification of ultraviolet rays.

Karl F. Gauss, 1792, Germany—Conception of non-Euclidean geometry.

James Hutton (A), 1795, U.K.—Theory of the Earth (T). Founding of the Science of

Geology.

Joseph Proust (A), 1799, France—The law of definite proportions of elements by weight in chemical compounds.

Karl F. Gauss, 1801, Germany - Mathematician and Physicist - the unit of electromagnetic induction is named after him.

Doppler Effect. *Christian Doppler (A), 1803-1853 Austria*—Doppler effect.

John Dalton, 1808-1827, U.K.—Modern chemical atomic theory.

Avogadro, 1811, Italy—Molecular hypothesis.

Andre Marie Ampere (A), 1814, France—Laws of electromagnetic forces.

William Wollaston & Von Fraunhofer, 1814, Germany—Discovery of dark lines in solar spectrum.

Anders Angstrom (A), 1814-1874, Sweden - Angstrom unit (ten billionth of a metre).

William Smith (A), 1815, U.K. - Stratigraphic geology for dating geological formations.

Christian Oersted (A), 1820, Denmark - Discovery of electromagnetism.

Von Helmholtz (A), 1821-1894, Germany—Formulation of the law of conservation of energy—the first law of thermodynamics.

Nikolai Lobachevsky (A), 1825-26, Russia—Formulation of non-Euclidean geometry.

Janos Bolyai (A), 1825-26, Hungary—Formulation of non-Euclidean geometry.

George S. Ohm (A), 1827, Germany—Statement of the law of electric conduction (Ohm's Law).

Friedrich Wohler (A), 1828, Germany—Synthesis of an organic compound from inorganic matter.

Michael Faraday (A), 1830-31, U.K.—Discovery of electromagnetic induction.

Julius R. Von Mayer, 1840, Germany—The law of conservation of energy—First law of thermodynamics.

Schönbein, 1840, Germany—Identification of Ozone.

Rudolf Clausius, 1850, Germany—The concept of entropy—Second law of thermo-

dynamics.

Edward Frankland (A), 1852, U.K.—Concept of chemical valency.

Michael Faraday, 1852, U.K.—Electrolysis.

George Boole (A), 1854, U.K.—Invention of Boolean algebra—the mathematization of logic.

Oceanography. *Mathew F. Maury*, 1855, U.S.—Founding of the science of Oceanography.

Von Bunsen and Gustav Kirchhoff (A), 1855 Germany—Spectrography to identify chemical elements by their spectra.

Charles Darwin (A), 1858–59, U.K.—Origin of Species (T).

A. R. Wallace (A), 1858–59, U.K. — The Theory of Evolution—Natural Selection.

Frederich Kekule (A), 1861, Germany—Establishment of organic chemistry as the chemistry of carbon compounds.

James Maxwell (A), 1864, U.K.—The mathematical theory of electromagnetic induction.

Gregor Mendel (A), 1865, Austria—Formulation of the laws of Genetics (heredity).

Dimitri Mendeleeff (A), 1869, Russia—A periodic law and periodic table of elements.

Georg Cantor (A), 1884, Germany *Mathematics*—Development of set theory, the basis of modern mathematics.

Svante Arrhenius (A), 1884, Sweden—Concept of ionisation of solutions.

Heinrich Hertz (A), 1887, Germany—Electrical magnetic waves called Hertz waves or radio waves.

William Roentgen (A), 1895, Germany—Short wave ray (X-ray).

Antoine Becquerel (A), 1896, France—Discovery of radio activity in uranium.

Joseph Thomson (A), 1897, U.K.—Discovery of the electron.

Sigmund Freud 1900, Austria—Founding of the Science of Psychoanalysis.

Quantum Theory. *Max Planck* (A), 1900, Germany—The quantum theory.

Ernest Rutherford (A), 1903, U.K.—Nature of radio active disintegration—

emission of Alpha, Beta and Gamma rays.

K. E. Tsiolkovsky (A), 1903, Russia—Formulation of the fundamental principle of rocket flights.

Binet & Simon, 1905, France—Intelligence Tests.

Albert Einstein, 1905–16 American—General and special theories of relativity.

Sockie, 1910, (W. Germany) Switzerland—Identification of Cosmic rays.

H. Kammerlingh-Onnes, 1911, Holland—Discovery of Superconductivity.

Soddy, 1912, U.K.—Theory of Isotopes.

Niels H.D. Bohr, 1913, Denmark—Formulation of the concept of the planetary atom.

Henry G. L. Mosly, 1913, U.K.—Establishment of the concept of atomic number.

Bertrand A. Russel, Alfred North Whitehead, 1913, U.K.—Completion of *Principia Mathematica* (T), a major contribution to symbolic logic.

Rutherford, 1919, U.K.—Splitting the atom.

Whitehead (England), *Louis V. de Broglie* (France) and *Erwin Schroedinger* (Germany), 1924–26—Formulation of wave mechanics in atomic theory.

Werner Heisenberg, 1925, Germany—Formulation of quantum mechanics in atomic theory.

Reflex Theory. *Ivan Petrovich Pavlov*, 1926, Russia, *Biology*—Conditioned reflexes.

Wolfgang Pauli, 1931, Germany—Postulation of existence of the neutrino—almost a quarter century before it was directly observed (1955).

James Chadwick, 1932, U.K.—Discovery of the neutron.

Carl D. Anderson, 1932, America—Discovery of the positron.

Murphy, 1934, America—Deuterium (heavy hydrogen). *Enrico Fermi* (b. Italy). Neutron bombardment of uranium, leading to the production of transuranium elements.

Lise Meitner (Austrian Swedish), *Otto Hahn* (German), and *Fritz Strassmann* (German), 1938—First nuclear fission of uranium.

Einstein's Last Dream

From the earliest times, man's dream has been to comprehend the complexity of nature in terms of as few unifying concepts as possible. In this context, in the history of physics, three names stand together; those of Newton, Maxwell and Einstein, as among the greatest synthesisers and unifiers of all time. Newton, some three hundred years ago, identified and unified terrestrial gravity (the force which makes apples fall) with celestial gravity (the force which keeps planets in orbit around the Sun). Maxwell, two hundred years later, unified the forces of electricity and magnetism. He further showed that light was one manifestation of this unification. Einstein, in 1905, unified the concepts of space and time. Eleven years later, he could show that Newton's gravity was a manifestation of this audacious unification in the sense that Newtonian gravity signified a curvature of the united space-time manifold. The question which Einstein then asked was this: Could Maxwell's electromagnetism be united with Newtonian gravity in the same way that Maxwell had united electricity and magnetism? If so, was Maxwell's electromagnetism also a manifestation of some other geometrical property of the space-time manifold just as Newtonian gravity was a manifestation of its curvature? This was Einstein's last dream. The researches of Abdus Salam and others lead us to believe that weak and strong forces can be combined with the forces of electromagnetism and gravity to form one unified force.

J. Robert Oppenheimer and others, 1945, America—Explosion of first atomic bomb.

Willard F. Libby, 1947, America—Development of atomic time clock—a method for determining geological age, by measuring the amount of radio active carbon-14 in an organic or carbon-containing object.

John Bardeen, Walter H. and Brattain, William Shockley, 1948, America—Formulation of theory of the transistor and its construction.

Atomic Energy Commission, 1951, America—Explosion of first nuclear fusion (hydrogen) bomb.

Charles H. Townes, 1954, America—Construction of first Maser.

Emilio G. Segre, American (b. Italy), Owen Chamberlain (American), 1955 America—Production and detection of the sub-atomic particles, the antiproton.

Laser. Gordon Gold, 1957, America—Construction of the first Laser.

USSR Academy of Science, 1957, Russia—First man-made satellite Sputnik put into orbit around the Earth.

James A. Van Allen, 1958, America—Discovery of belts of high energy radiation surrounding the Earth.

Francis H. C. Crick (Britain), James D.

Watson (America) and Maurice H. F. Wilkins (Britain), 1962—Discovery of the structure of the DNA.

Thomas A. Mathews and Allen R. Sandage, 1963, America—Discovery of quasars.

David Harker and others, 1967, America—Deciphering the structure of Ribonucleic Acid (RNA).

R. Bruce Merrifield and others, 1968, America—Synthesizing of ribonucleic molecule.

Antony Hewish (Cambridge), 1968, U.K.—Identification of Pulsars.

Har Gobind Khorana, 1970, America—makes the first synthetic gene, a duplicate of a gene found in yeast cell.

H. Temin, 1971, U.S.—Discovery of reverse transcriptase for synthesizing DNA from RNA.

The Skylab. National Aeronautical and Space Administration (NASA), 1973, US—The first orbiting laboratory—the Skylab.

Sam Ting and others, Burt Richter and others, 1974, U.S.—Detection of pai particles.

H. G. Khorana (M.I.T.), 1976, U.S.—replicates a bacterial gene and plants

it in a living cell, where, it started working. A working model of a synthetic gene.

Leon Lederman and others, 1976, U.S.—Discovery of particle with charm-confirmation of the concept.

G. S. Hurst and others, 1977, U.S.—Detection of single atoms.

P. Chambou and others, 1978, France—Discovery that large portions of the DNA of eukaryotic cells have no apparent function.

Supreme Court of U.S.A., 1980, U.S.—decides in favour of granting the first patent for inventing a life-form (a bacterium

in this case) to Ananda Chakarborty.

NASA, 1981, U.S.—Maiden voyage of the reusable Space Shuttle.

Nippon Electric Company, 1982, Japan—Development of a "read-only memory" (ROM) computer microchip with the capacity of storing one million bits of memory.

P. Armbruster and G. Muncenberg, 1982, W. Germany—Creation of Element 109, the heaviest so far.

NASA, 1983, U.S.—Pioneer 10, launched in 1972, becomes the first man-made object to leave the solar system.

45. INVENTIONS

Scientific inventions and discoveries are important because they lead to the creation of mechanisms and artifacts which improve or ease our living conditions. However, there is often a long time lag before the inventions are transformed into working utilities.

Reviewing some 46 discoveries between 1900 and 1950, *A History of Technology*[†] points out that longest intervals – 50 to 80 years – were taken up by the fluorescent lamp and the cotton picker and the shortest – one year – by Freon refrigerants.

Inventions and discoveries come about sometimes by accident but mostly by design. Roentgen discovered X-ray by accident in 1895 but the Curies laboriously pursued the radium and discovered it eventually in 1898. Most of the discoveries in the 20th century were the results of purposeful investigations and experiments, though some like penicillin were discovered accidentally.

Accidental discoveries are, in fact, few and far between but even then only a scientist of unusual acumen can identify it as a discovery in the first instance. Others might have noticed the same thing before to no purpose. The classic instance is the

Archimedes Principle. Thousands of people would have noticed that when they get into a full tub some water flows out. But Archimedes, alone among the thousands, could see a principle in it.

Many inventions have been made under the compulsive necessities of war. The Nazis developed rocketry and ballistic missiles to destroy England. America made the atom bomb to crush Japan. The Allies developed Radar and Sonar to protect themselves.

All these inventions have turned out to be quite beneficial in peacetime. Rocketry and missiles opened the way for space exploration and the epochal landing of men on the Moon. Atomic power is now being harnessed for peace-time uses. Radar and Sonar have been helpful in a number of ways. Sonar, for instance, has made commercial fisheries safer and more productive.

<i>Invention</i>	<i>Date</i>	<i>Inventor</i>	<i>Country</i>
Adding Machine	1623	Wilhelm Schickard	Germany
Aeroplane	1903	Orville & Wilbur Wright	U.S.A.
Airship (non-rigid)	1852	Henri Giffard	France
" (rigid)	1900	G. F. von Zeppelin	Germany
Bakelite	1907	Leo H. Baekeland	Belgium

[†] *A History of Technology*. Ed. Trevor I. William.

Balloon	1783	Jacques & Joseph Montgolfier	France
Ball-Point Pen	1888	John J. Loud	U.S.A.
Barometer	1644	Evangelista Torricelli	Italy
Battery (Electric)	1800	Alessandro Volta	Italy
Bicycle	1839-40	Kirkpatrick Macmillan	Britain
Bicycle Tyres (pneumatic)	1888	John Boyd Dunlop	Britain
Bifocal Lens	1780	Benjamin Franklin	U.S.A.
Bunsen Burner	1855	R. Willhelm von Bunsen	Germany
Burglar Alarm	1858	Edwin T. Holmes	U.S.A.
Car (steam)	c. 1769	Nicolas Cugnot	France
" (Petrol)	1888	Karl Benz	Germany
Carburettor	1876	Gottlieb Daimler	Germany
Carpet Sweeper	1876	Melville R. Bissell	U.S.A.
Cash Register	1879	James Ritty	U.S.A.
Cellophane	1908	Dr. J. Brandenberger	Switzerland
Celluloid	1861	Alexander Parkes	Britain
Cement (Portland)	1824	Joseph Aspdin	Britain
Chronometer	1735	John Harrison	Britain
Cinema	1895	Nicolas & Jean Lumiere	France
Clock (mechanical)	1725	I-Hsing & Liang Ling-Tsan	China
" (Pendulum)	1656	Christian Huygens	Netherlands
Copper working	c. 4500 B.C.	Earliest smelting site	
Dental Plate	1817	Anthony A. Plantson	U.S.A.
" (Rubber)	1855	Charles Goodyear	U.S.A.
Diesel Engine	1895	Rudolf Diesel	Germany
Disc Brake	1902	Dr. F. Lanchester	Britain
Dynamo	1832	Hypolite Pixii	France
Electric Blanket	1883	Exhibited Vienna Exhibition	
Electric Flat Iron	1882	H. W. Seeley	U.S.A.
Electric Lamp	1879	Thomas Alva Edison	U.S.A.
Electric Motor (DC)	1873	Zenobe Gramme	Belgium
" (AC)	1888	Nikola Tesla	U.S.A.
Electro-Magnet	1824	William Sturgeon	Britain
Electronic Computer	1824	Dr. Alan M. Turing	Britain
Film (moving outlines)	1885	Louis Prince	France
" (talking)	1922	J. Engl, J. Mussblle & H. Vogt	Germany
" (musical sound)	1923	Dr. Lee de Forest	U.S.A.
Fountain Pen	1884	Lewis E. Waterman	U.S.A.
Galvanometer	1834	Andre-Marie Ampere	France
Gas Lighting	1792	William Murdock	Britain
Glass (stained)	c. 1080	Augsburg	Germany
Glassware	c. 1500 B.C.	Egypt and Mesopotamia	
Glider	1853	Sir George Cayley	Britain
Gramophone	1878	Thomas Alva Edison	U.S.A.
Gyro-compass	1911	Elmer A. Sperry	U.S.A.
Helicopter	1924	Etienne Oehmichen	France
Hovercraft	1955	C. S. Cockerell	Britain
Iron Working (Carburized)	c. 1200 B.C.	Cyprus & N. Palestine	
Jet Engine	1937	Sir Frank Whittle	Britain
Laser	1960	Dr. Charles H. Townes	U.S.A.
Launderette	1934	J. F. Cantrell	U.S.A.
Lift (Mechanical)	1852	Elisha G. Otis	U.S.A.
Lightning Conductor	1752	Benjamin Franklin	U.S.A.
Linoleum	1860	Frederick Walton	Britain

Locomotive	1804	Richard Trevithick	Britain
Loom, power	1785	E. Cartwright	Britain
Loudspeaker	1900	Horace Short	Britain
Machine Gun	1718	James Puckle	Britain
Maps	c. 3800 B.C.	Sumerian (clay tablets of river Euphrates)	
Margarine	1869	Hippolyte M. Mouriés	France
Match, safety	1826	John Walker	Britain
Microphone	1876	Alexander Graham Bell	U.S.A.
Micro-processor	1971	Robert Noyce & Gordon Moore	U.S.A.
Microscope	1590	Z. Janssen	Netherlands
Motor Cycle	1885	G. Daimler of Cannstatt	Germany
Neon Lamp	1910	Georges Claude	France
Night Club	1843	Paris	France
Nylon	1937	Dr. Wallace H. Carothers	U.S.A.
Paper	A.D. 105	M. based fibre	China
Parachute	1797	A. J. Garnerin	France
Parchment	c. 1300 B.C.	Egypt	
Parking Meter	1935	Carlton C. Magee	U.S.A.
Pasteurization	1867	Louis Pasteur	France
Photography (on metal)	1826	J. N. Niepce	France
" (on paper)	1835	W. H. Fox Talbot	Britain
" (on film)	1888	John Carbutt	U.S.A.
Porcelain	851	Earliest report from China	
Potter's Wheel	c. 6500 B.C.	Asia Minor	
Printing Press	c. 1455	Johann Gutenberg	Germany
Printing (rotary)	1846	Richard Hoe	U.S.A.
Propeller (ship)	1837	Francis Smith	Britain
Pyramid	c. 2685 B.C.	Egypt	
Radar	1922	A. H. Taylor & Leo C. Young	U.S.A.
Radio Telegraphy	1864	Dr. Mahlon Loomis	U.S.A.
" (Transatlantic)	1901	G. Marconi	Italy
Rayon	1883	Sir Joseph Swan	Britain
Razor (electric)	1931	Col. Jacob Schick	U.S.A.
" (safety)	1895	King C. Gillette	U.S.A.
Record (long-playing)	1948	Dr. Peter Goldmark	U.S.A.
Refrigerator	1850	James Harrison & Alexander Catlin	U.S.A.
Rubber (latex foam)	1928	Dunlop Rubber Co.	Britain
" (tyres)	1846	Thomas Hancock	Britain
" (vulcanised)	1841	Charles Goodyear	U.S.A.
" (waterproof)	1823	Charles Macintosh	Britain
Rubik Cube	1975	Prof. Erno Rubik	Hungary
Safety Pin	1849	Walter Hunt	U.S.A.
Scotch Tape	1930	Richard Drew	U.S.A.
Self-starter	1911	Charles F. Kettering	U.S.A.
Sewing Machine	1829	Barthelemy Thimmonnier	France
Ship (sea-going)	c. 7250 B.C.	Grecian ships	
" (steam)	1775	J. C. Perier	France
" (turbine)	1894	Hon. Sir C. Parsons	Britain
Silk Manufacture	c. 50 B.C.	Reeling machines devised	China
Skyscraper	1882	W. Le Baron Jenny	U.S.A.
Slide Rule	1621	William Oughtred	Britain
Spectacles (convex)	1289	Venice	Italy

Spinning Frame	1769	Sir Richard Arkwright	Britain
Spinning Jenny	1764	James Hargreaves	Britain
Spinning Mule	1779	Samuel Crompton	Britain
Steam Engine	1698	Thomas Savery	Britain
Steam Engine (piston)	1712	Thomas Newcomen	Britain
Steam Engine (condenser)	1765	James Watt	Britain
Steel Production	1855	Henry Bessemer	Britain
Steel (stainless)	1913	Harry Brearley	Britain
Submarine	1776	David Bushnell	U.S.A.
Tank	1914	Sir Ernest Swington	Britain
Telegraph	1787	M. Lammond	France
Telegraph Code	1837	Samuel F. B. Morse	U.S.A.
Telephone	1849	Antonio Meucci	Italy
"	1876	Alexander Graham Bell	U.S.A.
Telescope	1608	Hans Lippershey	Netherlands
Television (mechanical)	1926	John Logie Baird	Britain
" (electronic)	1927	P. T. Farnsworth	U.S.A.
Terylene	1941	J. R. Whinfield, J. T. Dickson	Britain
Thermometer	1593	Galileo Galilei	Italy
Transformer	1831	Michael Faraday	Britain
Transistor	1948	Bardeen, Shockley & Brattain	U.S.A.
Typewriter	1808	Pellegrine Tarri	Italy
Washing Machine (elec.)	1907	Hurley Machine Co.	U.S.A.
Watch	1462	Bartholomew Manfredi	Italy
Water Closet	1589	Designed by J. Harrington	Britain
Welder (electric)	1877	Elisha Thomson	U.S.A.
Wheel	c. 3300 B.C.	Sumerian civilization	
Windmill	c. 600	Persian corn grinding	
Writing	c. 3500 B.C.	Sumerian civilization	
X-ray	1895	Wilhelm K. Roentgen	Germany
Zip Fastener	1891	W. L. Judson	U.S.A.

(Source: Guinness Book of Answers)

46. ELEMENTS

An element may be defined as "a substance which cannot be broken down to yield simpler substances by ordinary chemical methods". The elements are the basic substances from which all others are built up by chemical combinations.

Elements found in nature or naturally occurring elements number 92, ranging from Hydrogen, the lightest element (Element 1) to Uranium, (Element 92) the heaviest element. One element plutonium (Element 94) has been found in minute quantities in the ores of Uranium and Thorium.

All elements heavier than Uranium are man-made and are called *Transuranics*. They are produced either in nuclear reactors or accelerators or isolated from the debris of hydrogen bomb explosions. The first of such

elements is Neptunium (Element 93) discovered in 1940. The latest is Element 109 discovered in 1982 by the Institute for Heavy Ion Research (GSI) at Darmstadt (West Germany). *Elements up to 103 (1961) are included in this table.

All man-made elements decay quickly. Element 109, for instance, survives as such for only five-thousandths of a second and turns into Element 107 which after a short time emits an alpha particle and becomes

* Element 108 has not so far been discovered.

Element 105. Next one of the protons in the nucleus is transformed into a neutron, emitting a positive electron (Positron) in the process and becomes Element 104. This element splits into two and the process of decay is halted.

Isotopes. Elements are numbered according to the number of protons in their

atomic nuclei. But the atomic nucleus also contains neutrons which add to the mass of the atom and can affect its stability and radio activity. The atoms of the same element may contain different numbers of neutrons. These are called their isotopes. It is calculated that about 8000 isotopes may exist for the known atoms. Actually only 2000 are known today. The rest remains to be identified.

<i>Elements and Symbols</i>	<i>Atomic Number</i>	<i>Atomic Weight</i>	<i>Discoverer</i>	<i>Date</i>
Actinium	Ac	89	227.0 A. Debierne	1899
Aluminium	Al	13	27.0 F. Wohler	1827
Americium	Am	95	243 G. Seaborg & others	1944
Antimony	Sb	51	121.8 B. Valentine	1604
Argon	A	18	39.9 W. Ramsay and J. Rayleigh	1894
Arsenic	As	33	74.9 A. Magnus	(?) 1250
Astatine	At	85	210 E. Segre & others	1940
Barium	Ba	56	137.3 H. Davy	1808
Berkelium	Bk	97	249 S. Thompson & others	1949
Beryllium	Be	4	9.0 N. Vauquelin	1798
Bismuth	Bi	83	209.0 C. Geoffrey the Younger	1953
Boron	B	5	10.8 H. Davy	1808
Bromine	Br	35	79.9 A. Balard	1826
Cadmium	Cd	48	112.4 F. Stromeyer	1817
Calcium	Ca	20	40.1 H. Davy	1808
Californium	Cf	98	251 S. Thompson & others	1950
Carbon	C	6	12.0	Prehistoric
Cerium	Ce	58★	140.1 J. Berzelius & Wd' Hislinger	1803
Cesium	Cs	55	132.9 R. Bunsen & G. Kirchhoff	1860
Chlorine	Cl	17	35.5 K. Scheele	1774
Chromium	Cr	24	52.0 N. Vauquelin	1797
Cobalt	Co	27	58.9 G. Brandt	c. 1735
Copper	Cu	29	63.5	Prehistoric
Curium	Cm	96	248 G. Seaborg & others	1944
Dysprosium	Dy	66★	162.5 L. de Boisbaudran	1886
Einsteinium	E	99	254 A. Ghiorso & others	1953
Erbium	Er	68★	167.3 C. Mosander	1839
Europium	Eu	63★	152.0 E. Demarcay	1896
Fermium	Fm	100	253 A. Ghiorso & others	1952
Fluorine	F	9	19.0 H. Moissan	1886
Francium	Fr	87	223 M. Perey	1939
Gadolinium	Gd	64★	157.3 J. C. de Marignac	1880
Gallium	Ga	31	69.7 L. de Boisbaudran	1875
Germanium	Ge	32	72.6 C. Winkler	1886
Gold	Au	79	197.0	Prehistoric
Hafnium	Hf	72	178.5 D. Coster & G. De Hevesy	1923
Helium	He	2	4.0 J. C. P. Janssen & N. Lockyer	1868
Holmium	Ho	67★	164.9 J. Soret & M. Delafontai	1878
Hydrogen	H	1	1.0 H. Cavendish	1766
Indium	In	49	114.8 F. Reich & T. Richter	1863
Iodine	I	53	126.9 B. Courtois	1811

Iridium	Ir	77	192.2	S. Tennant	1803
Iron	Fe	26	55.9	....	Prehistoric
Krypton	Kr	36	83.8	W. Ramsay & M. Travers	1898
Lanthanum	La	57★	138.9	C. Mosanter	1839
Lawrencium	Lr	103	257.0	A. Ghiorso & others	1961
Lead	Pb	82	207.2	...	Prehistoric
Lithium	Li	3	6.9	A. Arfvedson	1817
Lutetium	Lu	71★	175.0	G. Urbain	1907
Magnesium	Mg	12	24.3	Recognized by J. Block	1755
Manganese	Mn	25	54.9	Recognized by K. Scheele	1774
Mendelevium	Mv	101	256	A. Ghiorso & others	1955
Mércury	Hg	80	200.6	....	Prehistoric
Molybdenum	Mo	42	95.9	K. Scheele	1778
Neodymium	Nd	60★	144.2	C. Von Welsbach	1885
Neon	Ne	10	20.2	W. Ramsay & M. Travers	1898
Neptunium	Np	93	237	E. McMillan & P. Abelson	1940
Nickel	Ni	28	58.7	A. Cronstedt	1751
Niobium					
(Columbium)	Nb	41	92.9	C. Hatchett	1801
Nitrogen	N	7	14.0	D. Rutherford	1772
Nobelium	No	102	254	Fields & others	1951
Osmium	Os	76	190.2	S. Tennant	1803
Oxygen	O	8	16.0	J. Priestley	1774
Palladium	Pd	46	106.4	W. Wollasten	1803
Phosphorus	P	15	31.0	H. Brand	1669
Platinum	Pt	78	195.1	D. de Ulloa	1735
Plutonium	Pu	94	242	G. Seaborg & others	1940
Polonium	Po	84	210.0	P. & M. Curie	1898
Potassium	K	19	39.1	H. Davy	1807
Praseodymium	Pr	59★	140.9	C. von Welsbach	1885
Promethium	Pm	61★	147	J. Marnsky & others	1947
Protactinium	Pa	91	231.0	F. Soddy & others	1917
Radium	Ra	88	226.1	P. & M. Curie	1898
Radon	Rn	86	222.0	Rutherford (thoron isotope)	1899
				E. Dorn (radon isotope)	1900
Rhenium	Re	75	186.2	E. Noddack & others	1925
Rhodium	Rh	45	102.9	W. Wollaston	1803
Rubidium	Rb	37	85.5	R. Bunsen & G. Kirchhoff	1861
Ruthenium	Ru	44	101.1	K. Claus (or Klaus)	1844
Samarium	Sm	62★	150.4	L de Boisbaudran	1879
Scandium	Sc	24	45.0	L. Nilson	1879
Selenium	Se	34	79.0	J. Berzelium	1817
Silicon	Si	14	28.1	J. Berzelium	1824
Silver	Ag	47	107.9	....	Prehistoric
Sodium	Na	11	23.0	H. Davy	1807
Strontium	Sr	38	87.6	H. Davy	1808
Sulphur	S	16	32.1	...	Prehistoric
Tantalum	Ta	73	181.0	A. Ekeberg	1802
Technetium	Tc	43	99	E. Segre & C. Pernier	1937
Tellurium	Te	52	127.6	M. von Reichenstein	1782
Terbium	Tb	65★	158.9	C. Mosander	1843
Thallium	Tl	81	204.4	W. Crookes	1861
Thorium	Th	90	232.0	J. Berzelium	1828
Thulium	Tm	69★	168.9	P. Cleve	1879

Tin	Sn	50	118.7	....	Prehistoric
Titanium	Ti	22	47.9	W. George	1791
Tungsten (Wolfram)	W	74	183.9	G. & F.d'Ethuyar	1783
Uranium	U	92	238.0	E. M. Peligot	1841
Vanadium	V	23	51.0	A. Delrio	1801
Xenon	Xe	54	131.3	W. Ramsay & M. Travers	1898
Ytterbium	Yb	70*	173.0	C. Marignac	1878
Yttrium	Y	39	88.9	J. Gabolin	1794
Zinc	Zn	30	65.4	....	Prehistoric
Zirconium	Zr	40	91.2	M. Klaproth	1789

* Rare Earths. Fifteen elements from atomic number 57 to 71 are collectively known as Rare Earths because they are remarkably similar in their chemical behaviour.

47. CRYOGENICS

Cryogenics is one of the youngest sciences, having come into existence only in the 20th century. The name 'Cryogenics' is derived from a Greek word meaning, 'productive of cold'. Cryogenics deals with the production of 'very low' temperatures and the study of their physical and technological consequences.

'Very low' temperatures are generally taken to mean temperatures below -150°C and thereabouts. Absolute Zero clearly belongs to the domain of cryogenics. It is apparently unattainable on Earth.

The lowest temperature that we have reached or rather produced on Earth is only one-millionth of a degree above Absolute Zero. Scientists the world over are continuously working at reaching at least one-hundredth of the degree Absolute. This is a world far below the freezing point as we understand it. In this sub-freezing world strange things happen.

All known elements freeze solid, except helium which remains liquid. Rubber becomes so brittle that it shatters like glass. Lead rings like a bell when struck. Air freezes into a solid block. All these happen not at the point of Absolute Zero but within about 10 points above it.

Helium. Helium, the second lightest of all gases (the lightest is hydrogen), has proved to be a most slippery and recalcitrant gas. Curiously enough, this gas was first found in 1868 in the Sun's atmosphere* by Sir Norman Lockyer, the British astronomer, through the spectroscope. In 1895 Sir William Ramsay

found it on Earth in the uranium ore - *Clevite*. Later it was established that helium is found in all radioactive minerals and that it is released on Earth by the radioactive decay of these minerals. Ordinary air contains 1 part in 200,000 of helium.

Helium has several usable advantages. It is inert and nonflammable. It is used for inflating airships. It resisted all attempts at liquefaction till 1908, when it succumbed to Dr. Kamerlingh-Onnes at Leyden. Thus, it is the last gas to be liquefied. Liquid helium has many remarkable properties which are not wholly understood as yet. It is indispensable in cryogenics as a medium to cool other substances to temperatures near the Absolute Zero. It is the only element that we know of which refuses to solidify even in the dangerous vicinity of Absolute Zero.

One of the surprises at low temperatures is **Superfluidity**. If liquid helium is poured into a flask, separated into two chambers by a partition, it seeps through the solid partition to become level in both chambers.

Superconductivity. Another surprising phenomenon is superconductivity. Superconductivity was first discovered at the University of Leyden in 1911 by Dr. H. Kamerlingh-Onnes, who was awarded the

* The name 'helium' is derived from *helios* meaning the Sun.

Nobel Prize in 1913 for his earlier work of liquefying helium. However, it was only in 1957 that the theory caught up with experiment. Nobel Prize winner Dr. John Bardeen (1956) of the University of Illinois and his associates presented the first theory of superconductivity in 1957. The theory is based on quantum mechanics and is highly technical. Some 300 materials – 25 elements and the rest alloys or compounds – are, now known to be superconductors.

The application of superconductivity (that is, the total disappearance of electrical resistance) to electric power engineering promises to increase capacity, reduce cost and improve reliability of power grids. A transmission line made of superconducting niobiumtin and roughly the diameter of arm, could carry as much power as the peak load now being used in the whole of the United States.

Cryogenics has thousands of other applications. Rapid freezing by liquid nitrogen, for instance, confers improved taste, texture, aroma, nutritive value and appearance to food articles besides reducing degradation by bacteriological, enzymatic, oxidative and chemical reactions.

Cryogenic freezing systems, being more economical than conventional systems, could be very handy for refrigerated transportation of marine food, fruits, vegetables and other perishable foods.

Blood Freezing. In medicine, human blood used for transfusion in hospitals cannot normally be preserved beyond three weeks. A new blood freezing technique recently developed using liquid nitrogen could now be used for storing bloods for months or even years. Cryogenics could also be used to store marrow cells in marrow banks of hospitals.

Cryosurgery has several advantages over normal surgery. It could be used to treat Parkinson's disease and other disorders of involuntary movement. Tumours could be frozen and removed with little loss of blood. Bloodless cryosurgery could also be used in tonsilectomies and in the removal of cataracts of the eyes.

Vast quantities of natural gases are burnt every year for want of economical methods for liquefying them in the country. The gases

Temperature Scales

Three systems of temperature measurement are now in use – the Celsius scale, the Fahrenheit scale and the Kelvin scale. The Celsius scale was worked out by the Swedish physicist and astronomer Anders Celsius in 1742.*

It appears to have been revised by another Swedish physicist J. P. Christen. This scale was originally known as the Centigrade. It was re-named Celsius scale in honour of its inventor Celsius. The Fahrenheit scale was devised by the German-born physicist Gabriel Daniel Fahrenheit (1686-1736) around 1715. The Kelvin scale was pioneered by the British physicist William Thompson Kelvin (1824-1907), later Lord Kelvin.

The International System of Units recognises the Celsius and Kelvin scales. The Kelvin scale is derived from thermodynamics and is of special importance to scientists. The scale generally used by all is the Celsius. The unit of temperature adopted by the SI is based on the Triple Point of Water, that is, the temperature at which solid, liquid, and gaseous water are all in equilibrium. The triple point has been defined as 273.16K† (Kelvin) which is equivalent to 0.01°C. Zero degree Kelvin is the Absolute Zero. This corresponds to -273.16° Celsius and -459.69° Fahrenheit.

Absolute Zero is a thermodynamic concept, that is to say, it is based on heat energy. It is the point at which molecules have no heat energy. At this point all motion stops. Even atomic particles slow down.

Conversion Formula

Kelvin to Celsius	$K = C + 273.16$
Celsius to Fahrenheit	$C = F - 32 \times 5/9$
Fahrenheit to Celsius	$F = C \times 9/5 + 32$

* In 1730 Rene Reaumur devised an alcohol thermometer with graduated scale 0° to 80°, 0° being the freezing point of water and 80° the boiling point. It was popular for a time but gradually went not to use.

† In 1967 the notation degree Kelvin (K°) was replaced by Kelvin (K)

burnt at the refineries or oil fields could be liquefied by cryogenic methods and transported to the remote corners of the country for use by those who do not have the advantage of city gas lines. Liquid methane could reduce the cost of supersonic flights by about one-third.

Work on application of cryogenics is at present going on in nearly a dozen centres in

India. They include the National Physical Laboratory, New Delhi, the Tata Institute of Fundamental Research, Bombay, the Indian Institute of Science, Bangalore, the Indian Association for Cultivation of Sciences, Jadavapur, the Physics Department of Delhi University, the Solid State Physics Laboratory, Delhi, and the Indian Institute of Technology, Kanpur.

48. TIME SYSTEMS

The earliest instruments for measuring time included many devices like the Sun dial and the water clock which were used in Egypt. These instruments were crude. In the 2nd century BC, Ctesibius, a Greek engineer of Alexandria, re-designed the ancient Egyptian water clock and made it popular.

The improved water clock was the best of the ancient timepieces. During the Middle Ages mechanical clocks run by falling weights came into vogue. These were more convenient than the water clocks but no more accurate. Both erred by as much as half an hour per day.

Time Units. In 1884 the second – the lowest unit of time – was defined as $1/86400$ of the time that the Earth took to complete one rotation on its own axis or $1/86400$ of a day of 24 hours. This, of course, meant that the 24-hour day was made up of 86,400 seconds.

But the Earth wobbles as it rotates. This wobbling leads to fluctuations in the time of rotation. It was therefore decided in 1960 to abandon the period of rotation as the primary unit (that is, a day of 24 hours), and to adopt the period of revolution (of the Earth round the Sun) as the basis of calculations. The second was thus re-defined as $1/31,556,925.9747$ of the time that the Earth took to complete one revolution round the Sun. A year of 365 days and odd, thus consisted of about 31.5 million seconds.

Atomic Time. In 1967 the *General Conference on Weights & Measures* recognised the atomic second as determined by the *cesium* (caesium) *atom clock* as the unit of time under the International System of Units (SI). The atomic second is defined as the time taken by the cesium electron to complete 9,192,631,770 spins.

The definition is not as accurate as it looks

because the cesium electron may sometimes take more spins and sometimes less spins than the defined norm. The deviation,

GMT CLOCKS STOP TICKING

Britain's keepers of Greenwich Mean Time plan to let their clocks run down and stop.

Officials announced in November 1985 that the observatory's six atomic clocks will be left to stop over the next two or three years because there isn't enough money to keep them going.

The observatory, which has been keeping time since its founding in 1675, will now have to rely on time readings provided by the International Organisation of Legal Metrology (Weights and Measures) in Paris.

The problem is that it costs 50,000–100,000 pounds a year to keep the clocks going.

At the heart of the clocks are expensive vacuum tubes, containing atomic element cesium which have to be replaced every few years.

Greenwich Mean Time, the standard for world timekeeping since 1884, will not really cease to exist. It is now known as Co-ordinated Universal Time and is based on readings from 150 atomic clocks around the world.

[AP: Nov. 11, 1985]

however, is only a few spins either way, that is, a few spins more or less than 9192 million spins. This is insignificant.

The atomic clock has two specific advantages. It is not affected by the vagaries of the atmosphere nor by the fluctuations in the rotation of the Earth. The latter has become important in recent years. For, it has been observed from 1970 onwards that the Earth is slowing down in rotation by nearly a second every year.

Since this error has been noticed, clocks all over the world are being corrected at the beginning of every year to conform to the atomic time. The atomic clock developed by the British National Physical Laboratory has achieved a very high degree of accuracy. It is accurate to one second in 300 years.

Universal Time. Since January 1972, a new standard of time called the *Co-ordinated Universal Time* (UTC) has also been maintained in Paris, the headquarters of the General Conference on Weights & Measures. This is not based on any single atomic clock but on the average of atomic clock readings from 18 timing centres around the world.

The UTC does not gain or lose more than one hundred millionth of a second per day. This has whittled down the infinitesimal error of the atomic clocks to the vanishing point. It is expected that the UTC will remain absolutely correct for a quarter million years.

Standard Time. The system of Standard Time was introduced to co-relate the time systems of various countries on an international basis. For this purpose the Earth was divided into 24 longitudinal zones, each zone being 15 degrees of an arc or one hour apart in time. The zero zone is centred at Greenwich (London) which gives the GMT or the Greenwich Mean Time. The 12th zone is divided by the 180th meridian, the International Date Line.

The zones to the east of this line are numbered from 1 to 12 with the prefix *minus* indicating the number of hours to be subtracted to obtain the Greenwich Time. The zones to the west are similarly numbered with the prefix *plus* which shows the number of hours that must be added to get the Greenwich Time.

The following zones are fast on Greenwich

Time by the number of hours indicated in brackets:

Fiji, New Zealand etc. (12 hrs.). New Caledonia, New Hebrides etc. (11). Queensland, Tasmania etc. (10). Japan, Korea etc. (9). China, Hongkong, Philippines etc. (8). Singapore (7½). Java, Thailand etc. (7). Burma, Cocos Keeling Islands (6½). Bangladesh (6). India, Sri Lanka, Andaman and Nicobar Islands (5½). Pakistan (5). Mauritius, Seychelles etc. (4). Iran (3½). Iraq, Ethiopia etc. (3). Turkey, Greece, Bulgaria etc. (2). Sweden, Norway, Denmark etc. (1).

The following areas are slow on Greenwich Time by the number of hours indicated:

Iceland, Madeira etc. (1). Azores, Cape Verde etc. (2). Greenland (excluding Scoresby Sound and Thule) and Eastern Brazil (3). Newfoundland, Labrador, Dutch Guiana and Uruguay (3½). Canada (East of 68°W.), Greenland (Thule area), Puerto Rico etc. (4). Canada (from 68°W. to 85°W. North). Jamaica, Bahama, Bahama Is., Cuba, Haiti, Peru, Panama etc. (5). Canada (from 85°W. North), Costa Rica, Salvador, Honduras, Guatemala, Nicaragua, Central parts of USA and parts of Mexico (6). Canada (from 102°W. to 120°W.), mountains States of USA and parts of Mexico (7). Canada (West of 120°W.), Alaska (south east), Western States of USA and parts of Mexico (8). Alaska (north of Cross Sound), Yukon, Christmas Is. (9). Alaska (from 141°W.), Hawaii etc. (10). Aleutian Is., Alaska (west coast), Samoa, Midway Is. (11).

International Date Line. The Date line is a zigzag line that coincides more or less with the 180th meridian. When the Date line is crossed to the west the date must be advanced by one day. When the Line is crossed to the east, the date must be set back by one day. The Line is deflected between north latitudes 48 and 75 with the result that all Asia lies to the west of the line.

The twenty-four-hour time is now being increasingly used especially by railways and other transport organizations. Its great advantage is that it dispenses with the suffixes *a.m.* and *p.m.* In the 24-hour system, day begins at midnight, the zero hour, and the hours that follow are consecutively numbered from 0 to 23.

49. NUMERALS

The numerals, now in everyday use, are called Arabic numerals, because it was from the Arabs that these numerals spread to Europe. Actually, they are Indian in origin and should rightly be called Indian numerals.

The concept of zero and the digital system (including decimals) are India's contributions to the science of numerals. The Arabs adopted the Indian system. The Europeans got it from the Arabs (See Landmarks of Science).

Among the authors, who were instrumental in transmitting Indian mathematical knowledge from Arab sources to Europe, the most famous is Leonard of Pisa (A.D. 1202). Other important authors were: John of Seville (1135), Adelard of Bath (1142), Robert of Chester (1142), Villedien (1240) and Sacrabosa (1242).

Roman Numerals. Roman Numerals are those used by the ancient Romans. They are letters converted into numbers 1 = I, V = 5, X = 10, etc. They do not follow the digital system of Arab numerals. The general rules of Roman numerals are the following: (1) Repeating a letter repeats its value: XX = 10 + 10 = 20. (2) A letter placed after one of greater value adds thereto: VI = 5+1 = 6. (3) A letter placed before another of greater value subtracts therefrom:

IV = 5 - 1 = 4. (4) A dash line over a numeral multiplies its value by thousand: X = 10 × 1000 = 10,000.

Some high Arabic numerals cause a lot of confusion, when used as words. The classic instance is *billion** which in U.S. is equal to a *thousand million* and in Britain to a *million-million*.

Arabic numerals and their corresponding Roman numbers are given below:

Arabic & Roman					
1	I	11	XI	30	XXX
2	II	12	XII	40	XL
3	III	13	XIII	50	L
4	IV	14	XIV	90	XC
5	V	15	XV	100	C
6	VI	16	XVI	200	CC
7	VII	17	XVII	400	CD
8	VIII	18	XVIII	500	D
9	IX	19	XIX	900	CM
10	X	20	XX	1000	M
<i>Multiples</i>		$\overline{V}$	5000,	$\overline{X}$	10,000; $\overline{L}$ 50,000,
		$\overline{C}$	100,000,	$\overline{D}$	500,000, $\overline{M}$ 1,000,000.

Higher Numerals

Number	US & France	UK & Other European Countries	India
1 & 5	zeros	One Hundred Thousand	One Lakh
" 6	"	Million	Ten Lakhs
" 7	"	Ten Million	One Crore
" 8	"	Hundred Million	Ten Crores
" 9	"	Billion	Hundred Crores
" 12	"	Trillion	.....
" 15	"	Quadrillion	.....
" 18	"	Quintillion	.....
" 21	"	Sextillion	.....
" 24	"	Septillion	.....
" 27	"	Octillion	.....
" 30	"	Nonillion	.....
" 33	"	Decillion	.....

* The word 'billion' wherever it is used in this book means a 'thousand million' (American sense) unless otherwise indicated.

50. INTERNATIONAL UNITS

During the first half of the present century, there were two widely used systems of Weights and Measures – the Imperial System and the Metric System. The Imperial System prevailed in the British Empire.

The English speaking countries including the United States also adopted the Imperial System. The Metric System was followed in France and other European countries and their colonies and dependencies.

Imperial System. The Imperial System was derived from the old Anglo-Saxon measurements. They were rough and ready units based on standards that were readily available everywhere – the human hand, for example. In their very nature, they could never be precise and, worse, they changed from person to person and from place to place.

The *inch* was the 'knuckle of the thumb. A *yard* was the distance from the tip of *King Edgar's* nose to the tip of the middle finger of his outstretched hand. An *acre* was the amount of land that could be ploughed in a day by a yoke of oxen. The *mile* came from the Roman legionaries. Their *milli* was 1000 paces or about 1618 yards. Paces being vastly different, the mile was eventually standardised at 1760 yards.

It was from such a conglomeration of odd units that the Imperial System of weights and measures was ultimately evolved. Although these basic units are now precisely defined, their conversion into larger or smaller units is an arithmetical torment. The mile, for example, is $12 \times 3 \times 220 \times 8$ inches and the short ton in $16 \times 16 \times 14 \times 2 \times 4 \times 20$ drams.

Metric System. The Metric System, unlike the Imperial System, was deliberately thought out. This system was adopted by France in 1790 and propagated in other European countries by Napoleon. As adopted in France, the new unit of length was the *metre* which was equal to one-ten millionth of a quadrant of the Earth's meridian. The unit of weight or mass was the *kilogram*, which was defined as the mass of a

cubic decimetre (0.1 c metre) of water. The volume represented by a cubic decimetre of water was to be called a *litre*.

In 1870 France called together a convention to evolve a unified metric system. In 1875 the Treaty of the Metre was signed in Paris. The treaty established an *International Bureau of Weights and Measures*, and a *General Conference on Weights and Measures*, which would meet periodically to adopt new definitions as the need arose.

In 1889 the metre and the kilogram were re-defined in terms of a bar of platinum-iridium alloy which was stored in a vault in Paris.

Today the metric system has been adopted by almost all nations.†

International System. In 1954 the General Conference on Weights & Measures adopted one form of the Metric system as an internationally suitable system. In 1960 the system was named *System International de Unites* or the International System of Units, shortened to SI.

The system rests on 4 independent base units for *length*, *mass*, *time* and *temperature*. The units for length and mass are the *metre* and the *kilogram* respectively. The unit of time is the *second*, which has been defined in terms of the atomic clock. The unit of temperature is the degree Celsius (centigrade) or *Kelvin* as opposed to Fahrenheit. The conference has also accepted certain well-established units like the *minute* and the *hour* (units of time), the *degree*, the *minute* and the *second* as units of angular measurement and the *nautical mile* and *knot*.

The spectacular development of science

† In 1971 the US decided to change over to the Metric System in ten years at the end of which the US will be predominantly but not exclusively on the Metric System. The Metric Conversion Act of 1975 legalised the change-over and set up the US Metric Board to supervise it

Table of Metric Weights and Measures
Linear Measure

10	Millimetres (mm)	=	1	centimetre	(cm)
10	centimetres	=	1	decimetre	(dm)
10	decimetres	=	1	metre	(m)
10	metres	=	1	decametre	(dcm)
10	decametres	=	1	hectometre	(hm)
10	hectometres	=	1	kilometre	(km)

Area Measure

100	square millimetres	=	1	square centimetre	
10,000	square centimetres	=	1	square metre	
100	square metres	=	1	are	(a)
100	ares	=	1	hectare	(ha)
100	hectares	=	1	square kilometre	(sq. km)

Volume Measure

	one litre	=		0.001 cubic metre	
10	millilitres (ml.)	=	1	centilitre	(cl)
10	centilitres	=	1	decilitre	(dl)
10	decilitres	=	1	litre	(l)
10	litres	=	1	decalitre	(dcl)
10	decalitres	=	1	hectolitre	(hl)
10	hectolitres	=	1	kilolitre	(kl)

Weight

10	milligrams (mg.)	=	1	centigram	(cg)
10	centigrams	=	1	decigram	(dg)
10	decigrams	=	1	gram	(g)
10	grams	=	1	decagram	(dcg)
10	decagrams	=	1	hectogram	(hg)
10	hectograms	=	1	kilogram	(kg)
1000	kilograms	=	1	metric ton	(t)

Cubic Measure

1000	cubic millimetres	=	1	cubic centimetre	
1000	cubic centimetres	=	1	cubic decimetre	
1000	cubic decimetres	=	1	cubic metre	

Simple Conversion Table Indian Units

Tolas to grams										
Tolas	1	2	3	4	5	6	7	8	9	10
Grams	11.66	23.33	34.99	46.66	58.32	69.98	81.65	93.31	104.97	116.64
Seers to kilograms										
Seers	1	2	3	4	5	6	7	8	9	10
Kilograms	0.93	1.87	2.80	3.73	4.67	5.60	6.53	7.46	8.40	9.33
Maunds to Quintals										
Maunds	1	2	3	4	5	6	7	8	9	10
Quintals	0.37	0.75	1.12	1.49	1.87	2.24	2.61	2.99	3.36	3.73

Double Conversion Tables for Weights and Measures

Note: The central figures (1 to 100) represent either of the two columns beside them, as the case may be.

Example: 1 centimetre=0.394 inch and 1 inch=2.540 centimetres.
1 metre=1.094 yards and 1 yard=0.914 metre. 1 kilometre=0.621 mile and 1 mile=1.609 kilometres.

Centimetres		Inches	Metres		Yards	Kilometres		Miles
2.540	1	0.394	0.914	1	1.094	1.609	1	0.621
5.000	2	0.787	1.829	2	2.187	3.219	2	1.243
7.620	3	1.181	2.743	3	3.281	4.828	3	1.864
10.160	4	1.575	3.658	4	4.374	6.437	4	2.485
12.700	5	1.969	4.572	5	5.468	8.047	5	3.107
15.240	6	2.362	5.486	6	6.562	9.656	6	3.728
17.780	7	2.756	6.401	7	7.655	11.266	7	4.350
20.320	8	3.150	7.315	8	8.749	12.875	8	4.971
22.860	9	3.543	8.230	9	9.843	14.484	9	5.592
25.400	10	3.937	9.144	10	10.936	16.094	10	6.214
127.000	50	19.685	45.720	50	54.681	80.468	50	31.068
254.000	100	39.370	91.439	100	109.361	160.936	100	62.136

Hectares		Acres	Square Kilometres		Square Miles	Kilograms		Av. Pound
0.404	1	2.471	2.590	1	0.386	0.454	1	2.205
0.809	2	4.942	5.180	2	0.772	0.907	2	4.409
1.214	3	7.413	7.770	3	1.158	1.361	3	6.614
1.619	4	9.884	10.360	4	1.544	1.814	4	8.818
2.023	5	12.355	12.950	5	1.931	2.268	5	11.023
2.428	6	14.826	15.540	6	2.317	2.722	6	13.228
2.833	7	17.298	18.130	7	2.703	3.175	7	15.432
3.237	8	19.769	20.720	8	3.089	3.629	8	17.637
3.642	9	22.240	23.310	9	3.475	4.082	9	19.842
4.047	10	24.711	25.900	10	3.861	4.536	10	22.046
20.234	50	123.554	129.498	50	19.306	22.680	50	110.231
40.468	100	247.108	258.995	100	38.611	45.359	100	220.462

Metric Tonnes		Long Tons	Metric Tonnes		Short Tons	Litres		Pints
1.016	1	0.984	0.907	1	1.102	0.568	1	1.760
2.032	2	1.968	1.814	2	2.205	1.136	2	3.520
3.048	3	2.953	2.722	3	3.307	1.705	3	5.279
4.064	4	3.937	3.629	4	4.409	2.273	4	7.039
5.080	5	4.921	4.536	5	5.512	2.841	5	8.799
6.096	6	5.905	5.443	6	6.614	3.409	6	10.559
7.112	7	6.889	6.350	7	7.716	3.978	7	12.319
8.128	8	7.874	7.257	8	8.818	4.546	8	14.078
9.144	9	8.858	8.165	9	9.921	5.114	9	15.838
10.161	10	9.842	9.072	10	11.023	5.682	10	17.598
50.803	50	49.211	45.359	50	55.116	28.412	50	87.990
110.605	100	98.421	90.718	100	110.231	56.824	100	175.980

Litres		Gallons	Litres		Gallons
4.546	1	0.220	31.822	7	1.540
9.092	2	0.440	36.368	8	1.760
13.638	3	0.660	40.914	9	1.980
18.184	4	0.880	45.460	10	2.200
22.730	5	1.100	227.298	50	10.999
27.276	6	1.320	454.596	100	21.997

and technology compelled the conference to define precisely, generally known units of measurement like length, mass or time. In addition, the conference had to adopt and define new units of measurement. The labours of the Conference in this regard led to the evolution of a complicated and highly technical international system. The definitions are stated in strict scientific jargon which the layman can hardly follow. A brief outline of the system is given below.

The S.I. Units are broadly divisible into three classes.

1. Base units which form the foundations of the system.
2. Derived units which are generally formed by a combination of Base units.
3. Supplementary units which are used in angular measurement.

The special feature of the system is its coherence. A coherent set of units can be defined as one that arises, when a quotient or product of any two quantities leads to the unit of the resultant quantity. In other words, all units of the system hold together and are explicable in terms of other units.

International Units

Base unit	Symbol	Year of Adoption
METRE-Unit of length	m	1960
KILOGRAM-Unit of mass	kg	"
SECOND-Unit of time	S	1967
AMPERE-Unit of electric current	A	1948
KELVIN-Unit of thermodynamic temperature	K	1967
CANDELA-Unit of luminous intensity	cd	"
MOLE-Amount of substance*	mol	1971

*One mole (mol) is an amount of substance in grams equal to its molecular weight.

Supplementary Units

RADIAN-Plane angle	rad	1960
STERADIAN-Solid angle	sr	1960

Base Units
Simple Expression in Terms of
Base Units

Quantity	Name	Symbol
Area	square metre	m ²
Volume	cubic metre	m ³
Speed	metre per second	m/s
Density	Kilogram per cubic metre	kg/m ³
Specific Volume	cubic metre per kilogram	m ³ /kg
Luminance	candela per square metre	cd/m ²

The base units are defined as under:

Metre. The General Conference on Weights and Measures, an international organization based in France, decided to give a new definition to the metre. Now "the metre is the length of the path travelled by light in vacuum during a time interval of 1/299,792,458 of a second".

Kilogram. It is the mass of the international prototype of the kilogram, which is in the custody of the "Bureau International des Poids et Mesures (BIPM) Sevres", near PARIS. Among the base units, the unit of mass is the only one whose name, for historical reasons, contains a prefix (Kilo).

Second. It is the duration of 9192631770 periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of the Caesium-133 atom.

Ampere. It is that constant current which, if maintained in two straight parallel conductors of infinite length, of negligible cross section, and placed at a distance of 1 metre

Derived Units with Special Names

Quantity	Name	Symbol
Frequency	hertz	Hz
Force	newton	N
Pressure	pascal	Pa
Quantity of electricity	coulomb	C
Electric tension	volt	V
Electric resistance	ohm	Ω
Luminous flux	lumen	lm
Illuminance	lux	lx

apart in vacuum, would produce between these conductors a force equal to 2×10^{-7} newton per metre of length.

Kelvin. It is the fraction $1/273.16$ of the thermodynamic temperature of the triple point of water.

Candela. It is the luminous intensity, in the perpendicular direction, of a surface of $1/600000$ square metre of a black body at the temperature of freezing platinum under a pressure of 101 325 newtons per square metre.

Mole. It is the amount of substance of a system which contains as many elementary entities as there are atoms in 0.021 kilogram of carbon 12.

Supplementary Units. The supplementary units are 1. Radian (rad) Plane angle and 2. Steradian (sr) Solid Angle.

Radian. It is the plane angle which, having its vertex at the centre of a circle, cuts off a length on the circumference of the circle equal to the radius of the circle.

Steradian. It is the solid angle which, having its vertex at the centre of a sphere, cuts off an area of the surface of the sphere equal to that of a square with sides of length equal to the radius of sphere.

Multiples and Subdivisions. Multiples and subdivisions (fractions) are indicated by appropriate prefixes. Multiples upto 1000 are indicated by the following prefixes – deca (10), hecto (100), and kilo (1000). Fractions up to 1000 are expressed as follows – deci (1/10), centi (1/100), and milli (1/1000).

For multiples and fractions above 1000 the following prefixes have been adopted.

Thus a kilometre is 1000 metres and a megametre is 1,000,000 metres while a milli-

Multiples

Tera	= 10^{12}	(1 followed by 12 zeros)
Giga	= 10^9	" 9 "
Mega	= 10^6	" 6 "
Kilo	= 10^3	" 3 "
Hecto	= 10^2	" 2 "
Deca	= 10^1	" 1 "

Fractions

Deci	= 10^{-1}	(0.1)
Centi	= 10^{-2}	(0.01)
Milli	= 10^{-3}	(0.001)
Micro	= 10^{-6}	(Decimal point, followed by 5 zeros and 1)
Nano	= 10^{-9}	(Decimal point, followed by 8 zeros and 1)
Pico	= 10^{-12}	(Decimal point, followed by 11 zeros and 1)
Femto	= 10^{-15}	(Decimal point, followed by 14 zeros and 1)
Atto	= 10^{-18}	(Decimal point, followed by 17 zeros and 1)

metre is 0.001 metre and a micrometre is 0.000,001 metre.

Rules. Very elaborate rules have been formulated with regard to notation, type to be used, prefix symbols and the exponent to be prefixed to a symbol. Symbols are not to be followed by full stop and do not change in the plural.

Outside S.I. In 1969 the International Committee on Weights and Measures (CIPM), an auxiliary of the General Conference, recognised the use of some units which were strictly not part of the SI but which were in widespread use. Some of the commoner units and their SI equivalents are given below:

Triple Point.

The triple point of a substance is the combination of temperature and pressure at which its solid, liquid and gas phases can co-exist. For water the triple point lies at a temperature of 0.1 degree Celsius and a pressure of 6.104 millibars. Water molecules whose environment is near to the triple point can be freely interconverted among all the three states.

SI Equivalent

Length

1 angstrom	0.1	nanometre (nm)
1 chain	20.12	metre (m)
1 engineer's chain	30.48	do
1 fathom	1.829	do
1 foot	0.304 8†	do
1 furlong	0.201 2†	kilometre (km)
1 inch	25.4	nanometre (nm)
1 link	0.201 2†	metre (m)
1 mile	1.609	kilometre (km)
1 nautical mile		
international	1.852	do
1 nautical mile telegraph	1.855	do
1 nautical mile U.K.	1.853	do

Area

1 acre	4047	sq. metre
1 sq. foot	929.0	sq. centimetre
1 sq. mile	2.590	sq. kilometre
1 sq. yard	0.836 1†	sq. metre

Volume

1 cubic foot	28.32	cubic decimetre
1 cubic inch	16.39	do centimetre
1 fluid ounce	28.41	do do
1 gallon, imperial	4.546	cubic decimetre
1 gallon US	3.785	do do
1 pint, imperial	0.586 3†	do do

† Among the rules of notation for S.I. one rule says that where a numerical value contains more than three digits, it is advisable to separate the digits into groups of three moving to the left or right of the decimal point. The separation is to be indicated by omitting a space and not by

Mass

1 grain	64.80	milligram
1 hundred weight	50.80	kilogram
1 maund	37.32	do
1 ounce	28.35	gram
1 pound	0.453 6†	kilogram
1 quintal	100	do
1 seer	0.933 1†	do
1 tola	11.66	gram
1 ton	1.016	tonne
1 ton US	0.907 2†	do

Velocity

1 foot per minute	0.005 08†	metre per second
1 foot per second	0.304 8†	metre per second
1 inch per second	25.4	millimetre per second
1 knot	0.514 4†	metre per second
	1.852	km per hour
1 knot UK	0.514 7†	metre per second
	1.853	km per hour
1 mile per hour	0.447 0†	metre per second
	1.609	km per hour

Fuel Consumption

1 gallon per mile	2.825	litre per km
1 US gallon per mile	2.352	do
1 mile per gallon	0.354 0†	km per litre
1 mile per US gallon	0.425 1†	km per litre

a comma as is usually done. The omission of space in its number 5 in the above table (0.304 8 instead of 0.304.8) and other similar omissions are to be treated as commas and read accordingly.

51. THE WORLD OF MEDICINE

The world is endowed with many systems of Medicine; Allopathy, Homeopathy, Ayurveda, the Arabic, the Egyptian, the Graeco-Roman,...etc. While the Western system has entrenched itself with multifarious growth, there is a growing awareness about the distinctive efficacy of Eastern systems like the Ayurveda.

All ancient civilisations—Egypt, Babylon, India and China—developed their own systems of medicine. Egypt seems to have been the first and the best in the field. It had a fully developed medical system by the third millennium B.C.

We know very little of the Babylonian system and much less, almost nothing, of the Indus Valley system. The Indian system, we know it, starts with the Rigveda (2000 B.C.). The earliest known medical treatise in China appeared around 450 B.C.

Egyptian System. The Egyptian system, like all other ancient systems, laboured under a heavy load of superstition and magic. Yet it developed many cures that have stood the test of time. Pain-killing drugs and sedatives were well-known to the Egyptians. Queen Nefretiti is portrayed in a bas-relief as administering a pain-killing drug to her ailing husband, the Pharaoh. *Henbane*, a herb, which is known to us as a sedative source was first used by the Egyptians. *Onion* as a cure for scurvy and also as a cure for intestinal disorders is an old Egyptian prescription.

The Chinese system must have been many centuries old when the first great medical treatise appeared in China around 450 B.C. This treatise, unlike the Indian *Rigveda* and the later *Atharvaveda*, is an elaborate treatise on medicine, comparable to the *Susruta Samhita* or the *Charaka Samhita* of India. It included, among others, detailed descriptions of *acupuncture* which has received international publicity during recent times. Between 600 and 900 A.D., the Chinese system of medicine, known as *Han-Yi*, had spread to Korea and Japan and much of South East Asia.

Ancient China had developed many cures, some of which have come down to modern times. *Ephedra*, a herb which soothes coughs, was known to the Chinese 4000 years ago. *Rhubarb* as a laxative was first used in China. *Pumpkin* seeds, another Chinese contribution, is a well-known worm-riddler. It is now found to be effective against snail fever also.

Graeco-Roman. The Graeco-Roman system was almost entirely derived from the Egyptian system. Most of its cures are of Egyptian origin. To the Greeks, we owe the

first revolutionary change in medical practice—the liberation of medicine from superstition and magic. *Hippocrates*, a Greek physician known as the Father of Medicine in the West, condemned the use of charms and chants in medicine. He laid down a code of conduct for medical practitioners. Scientific therapy started with Hippocrates.

The Arabs revolutionised the science of medicine by effecting a synthesis of Indian medical system and the Graeco-Roman system. They passed on this knowledge to Europe. The influence of Arabic medicine on Europe was widespread and longstanding. *Qunun* (Canon) written by the Arab scholar *Avicenna* (11th cent. A.D.) became the primary text of medical studies in Europe and continued to be so as late as the 17th century.

Under the Mughal Emperors, Arab medicine came to India. It took root in India, under the name of *Unani*, mainly because there was so much in common between the old Indian system and the new Unani system. The term *Unani* is derived from the Sanskrit *Yavana* meaning Greek. The Unani system continues to this day in India.

Ayurveda. The Indian System known as *Ayurveda* originated as far back as 2000 B.C. *Ayurveda* is a compound word in Sanskrit, meaning, literally, *the Science of Life*. Actually, it implies two connected ideas—the science of life and the art of living.

Ayurveda, unlike allopathy or homeopathy, does not swear by any particular principle of cure. Ayurvedic treatment covers all the principles of allopathy, homeopathy and naturopathy. Thus, says Pandit Shiv Sharma, President of the Central Council of Indian Medicine, "the homeopathic opium which cures constipation and the allopathic opium which causes it,

MILESTONES OF MEDICINE

Invention/Discovery	Date	Inventor/Discoverer	Country
Ayurveda	2000-1000 BC	Atreya	India
Western Scientific Therapy	460-370 BC	Hippocrates	Greece
Yoga	200-100 BC	Patanjali	India
Ashtanga Hridaya	c.550 AD	Vagbhata	India
Sidhayoga	c.750	Vrdukunta	India
Anatomia*	1316	Mondino	Italy
Chemotherapy	1493-1541	Paracelsus	Switzerland

* First book on Anatomy

MODERN MEDICINE

Circulation of blood	1628	William Harvey	Britain
Biochemistry	c.1648	Jan Baptista Van Helmont	Belgium
Bacteria	1683	Leeuwenhock	Holland
Neurology	1758-1828	Franz Joseph Gall	Germany
Physiology	1757-66	Albrecht Von Haller	Switzerland
Vaccination	1796	Edward Jenner	Britain
Histology	1771-1802	Marie Bichat	France
Stethoscope	1819	Rene Laennec	France
Embryology	1792-1896	Karl Ernest-Van Baer	Estonia (USSR)
Morphine	1805	Friderich Serturner	Germany
Chloroform as anaesthetic	1847	James Simpson	Britain
Rabies Vaccine	1860	Louis Pasteur	France
Bacteriology	1872	Ferdinand Cohn	Germany
Leprosy bacillus	1873	Hansen	Norway
Cholera, T.B. germs	1877	Robert Koch	Germany
Malaria germs	1880	Laveran	France
Diphtheria germs	1883-84	Klebs & Löffler	Germany
Aspirin	1889	Dreser	Germany
Virology	1892	Ivanovski & Bajernick	USSR, Holland
Psycho-analysis	1895	Sigmund Freud	Austria
Serology	1884-1915	Paul Ehrlich	Germany
Anti-toxins			
(science of immunity)	1890	Behring & Kitasato	Germany, Japan
Adrenaline	1894	Schafer and Oliver	Britain
Endocrinology	1902	Bayliss & Starling	Britain
Electro-Cardiograph	1906	Einthoven	Holland
Typhus Vaccine	1909	J. Nicolle	France
Sex hormones	1910	Eugen Steinach	Austria
Vitamins	1912	Sir F.G. Hopkins	Britain
Vitamin C	1912	Froelich Holst	Norway
Vitamin A	1913	McCollum and M. Davis	USA
Vitamin B	1916	McCollum	USA
Synthetic Antigens	1917	Landsteiner	USA
Thyroxin	1919	Edward Calvin-Kendall	USA
Insulin for Diabetes	1921	Banting & Best	Canada
Vitamin D	1922	McCollum	USA
Vitamin B1	1926	Minot & Murphy	USA
Penicillin	1928	Alexander Fleming	Britain
Cortisone	1936	Edward Calvin-Kendall	USA
D.D.T. (Dichloro-Diphenyl- Trichloroethane)	1939	Paul Muller	Germany
Rh-factor	1940	Karl Landsteiner	USA
Streptomycin	1944	Selman Waksman	USA
LSD (Lysergic acid diethylamide)	1943	Hoffman	Switzerland
Kidney Machine	1944	Kolf	Holland
Chloromycetin	1947	Burkholder	USA
Aureomycin	1948	Duggar	USA
Reserpine	1949	Jal Vakil	India
Terramycin	1950	Finlay & Others	USA
Cryo-Surgery	1953	Henry Swan	USA
Open Heart Surgery	1953	Walton Lillehel	USA
Poliomyelitis vaccine	1954	Jonas Salk	USA

Poliomyelitis vaccine (oral)	1954	Albert Sabin	USA
Contraceptive pills	1955	Pincus	USA
Use of artificial heart for surgery	1963	Michael de Bakey	USA
Heart Transplant Surgery	1967	Christian Barnard	S.Africa
First Test Tube Baby	1978	Steptoe & Edwards	Britain
Gene Therapy on humans	1980	Martin Clive	USA
Small Pox eradicated	1980	W.H.O. Declaration	
Genes associated with Cancer	1982	Robert Weinberg & others	USA

both fall within the Ayurvedic therapeutic measures".

According to Ayurveda, "there are three basic constituent complexes in the physiological system called *doshas*. They are *Vayu* or *Vata*, *Pitta* and *Kapha* or *Sleshma*. These terms, though literally they mean *wind*, *bile* and *phlegm* respectively, embrace much more. Between them, they sustain the whole body metabolism.

Good health implies an ideal balance between the three doshic factors. No true *mono-doshic* individual exists. It is the predominance of any particular *dosha* which marks the constitutional types of men. On this basis, humans are divided into three psychosomatic types, namely the *Vataprakriti*, the *pitta-prakriti* and the *kaphaprakriti*.

The Ayurvedic physician has to evaluate

the *doshic* picture of the patient and find out what type of *tridosha* predominates and set right the imbalance by prescribing drugs, diets and practices.

Western System. The western system of medicine was later named *Allopathy* by *Hahnemann* to distinguish it from his own system Homeopathy. *Allo*, from the Greek work *Alos*, means other or another, and implies the treatment of diseases by other drugs, that is, drugs having effects opposed to the symptoms. Homeo, from Greek word *Homos**, means treatment by drugs having the same effects as the symptoms of disease. In other words, homeopathy (literally, similar suffering) is based on the principle 'like cures like' while allopathy is based on the principle that opposites cure opposites.

52. AIDS AND CANCER

While the fight against the age-old malady of *Cancer* by medical scientists and researchers made headway around the world, *AIDS* emerged as the fiercest threat to mankind since the Black Death. In US alone an estimated 500,000 to one million people were believed to have been infected with the deadly disease by the middle of 1985.

The death of popular Hollywood star Rock Hudson caused by AIDS in October 1985 hit the Americans as a bolt from the blue and Hudson's long time friend and co-star Elizabeth Taylor announced the formation of a national foundation to seek cure for AIDS. Fear and panic spread all over the world as the disease eluded early detection and response to treatment.

Aids Virus: Blood and other body fluids are the main carriers of the AIDS virus and anal intercourse is by far the most dangerous form of sex as there can be exchange of blood during the act, according to the World

Health Organisation.

In an article in the *WHO Chronicle*, the organisation has called for a spread of awareness among people of the causes and transmission routes of the crippling Acquired Immune Deficiency Syndrome (AIDS) and an attitude of sympathy and understanding towards its victims.

The disease said to be caused by a virus, designated HTLV-iii/LAV, was until recently believed to be restricted to homosexual men and hemophiliacs (people with deficient

* Homeo is derived from the Greek word *homos* meaning 'the same', not the Latin word *homo* meaning 'man'

blood clotting mechanism) who require frequent intake of clotting products, but new evidence has revealed even heterosexuals are going down with it.

Transmission: Intravenous drug abusers are also at great risk of infection from active carriers of the virus, through infected hypodermic needles as they are rarely sterilised. People carrying the virus do not always show symptoms of AIDS but they readily transmit the virus. As sharing of needles is common among drug abusers, the virus passes on destroying the body's immune system.

The virus, once in the blood, multiplies many times faster than other viruses, and progressively destroys the T-cells in the blood which help fight infections by activating B-cells which multiply and produce antigens to fight any infection. The virus so effectively destroys T-cells that they cannot alert the B-cells. Hence the crippling of the immune system.

The body becomes hopelessly vulnerable to any infection, and the first to strike an AIDS victim is a rare skin cancer, known as Kaposi's sarcoma.

Via Blood Stream: Blood transfusion recipients also contract the disease as AIDS carriers will pass on their viruses to the blood-stream when they donate their blood. Tests have now been deemed mandatory at all blood centres in Europe and America to identify the virus in the donor's blood before receiving it.

Pregnant women, carrying the AIDS virus, also deliver babies with the killer disease, which has already spread to thousands of people across continents and has, as yet, no cure.

The WHO has appealed to people and health workers to be aware of the precautions to take while attending on AIDS patients and in handling their specimens. The organisation has, however, appealed to health workers to change their attitudes and not to be hostile to patients with sexually transmitted diseases.

Guidelines: The guidelines say that anal intercourse transmits the virus through blood and that though open mouth kissing and oral contact with the genitals may not always involve danger, they might pass on

AIDS and India

A task force on AIDS has been constituted by the Indian Council of Medical Research (ICMR) to formulate an action plan and strategies to prevent and reduce the risks of the onset of its infection in India.

"Though no authentic case of AIDS has been reported from India, it does not mean that it does not exist", ICMR Director General, Prof. V. Ramalingaswami told the task force.

In terms of sheer mathematical probability, it must be a certainty that the combined population of India and China (closer to 2 billion) will throw up a few thousand AIDS victims. It has been reported by the Indian Health Organization that unconfirmed reports of AIDS cases have come in from Lucknow, Delhi & Bombay.

As Dr. I. S. Gilada, honorary secretary of the IHO, points out, "There is no special immunity that Asians enjoy" and neither is homosexuality or drug abuse totally absent from our social fabric. Whether from visitors across the Atlantic or the Gulf States, AIDS will come to India and the quicker we accept the fact the better.

It is understood that certain countries, including the UK, have banned the import of factor VIII used in the treatment of haemophilia for fear of AIDS contamination, and yet India is still dependent on it. Such instances and the area of accidental interaction between monkeys and human beings in India warrant greater scrutiny under Indian microscopes.

the infection.

The use of condoms reduces the risk of infection but it does not completely eliminate it. Sharing of tooth-brushes and razors, which contain the blood of the user, is also likely to cause infection.

Pregnant women, infected with AIDS or carrying the virus, may infect the foetus or deliver babies with the disease as the foetus in the womb is in constant contact with body fluids and blood, which carry the virus.

Fatal: Where AIDS differs from other ailments, such as the more commonplace STDs (syphilis and gonorrhoea) and plagues (Cholera, Small-pox, Bubonic plague) is the fact that it has no known cure. No other endemic disease is as fatal, and even in the epidemics of bubonic plague and small-pox that raged like wildfire across different parts of the world, the mortality rate was under 50 per cent even if untreated. In such cases the body's immunity system swung into action.

But AIDS strikes at the very source that accords the body its resilience.

Medical research is proceeding feverishly to find a cure and there are reports from the US, France and Israel that AIDS will be conquered – though only time will tell for certain. US federal assistance for AIDS research has leapt from 5 million dollars to 106 million in the last three years – and Rock Hudson may yet not have died in vain.

CANCER: EXPLORING THE CAUSES

CANCER is one of life's most fearsome threats and is a biological marvel as well. But as biologists learn more about how the disease starts and develops, they are discovering that cancer has an extraordinary natural history.

Although the attention given recently to cancer genes – the so-called *Oncogenes* – suggests that a slight mutation in a certain gene can turn a cell cancerous, the cause of cancer is far from being so simple. Before cancer can start, in fact, a whole series of rare events must occur. Indeed, the events are so unlikely that many cancers do not arise unless cells grow and divide many times during several decades of exposure to certain chemicals.

Carcinogens: The cancer process probably starts in many people through contact with certain chemicals called carcinogens. Benzo(a)pyrene, from cigarette smoke and many other *sources*, is an example. Contrary to popular impression, however, carcinogens do not in their original form cause cancer. They must undergo a molecular modification inside a human cell before acquiring true cancer-causing ability. The process is called *activation*.

The most common activating mechanism involves a set of enzymes that cells use to detoxify alien substances, converting them to a form that can be excreted harmlessly. Thus when carcinogens enter cells, all or nearly all are properly detoxified.

Harry Gelboin of the U.S. National Cancer Institute has found, however, that some people have an unusual combination of detoxification enzymes that perform the wrong modification to carcinogen molecules; instead of being rendered harmless, the carcinogens are altered in such a way that they

can more easily enter the cell's nucleus and bind irreversibly to DNA. This modification of the carcinogen is called activation, the first step toward a cancer-causing mutation.

DNA Repair: It is the rare activated carcinogen that makes it into the nucleus to bind with DNA. And even then, harmful consequences are unlikely, for cells have yet another natural line of defence – a built-in DNA repair mechanism. This consists of special molecules in the nucleus that somehow are able to detect abnormalities such as alien molecules attached to the DNA.

The repair enzymes perform a kind of surgery on the DNA, cutting out a small segment containing the defect and allowing the segment to be rebuilt from fresh DNA subunits, or nucleotides, that are normally available in the nucleus. Since the damage usually affects only one of two paired nucleotides in the DNA's double helix, the intact nucleotide sequence serves as a template for replacing the segment that was removed.

If DNA repair occurs before the cell undergoes its next division into two daughter cells, the cancer process is blocked. But if the repair mechanism is faulty or if the cell divides before repair occurs, the portion of the genetic message affected by the bound carcinogen may be copied abnormally. The daughter cells will then inherit a gene with a mutation – a genetic message with a word or letter changed. The mutation is safe from any repair mechanism because it consists of

DNA that is molecularly normal. In future cell divisions, all progeny will inherit the mutation.

Radiation: Not all cancerous mutations are the result of chemical carcinogens. Some are caused by radiation when subatomic particles hit a DNA strand and damage it. Still others may be the result of random rearrangements of genes along the chromosome. Sometimes before cell division, chromosomes will break and detached pieces may get spliced back into wrong chromosomes.

It has been shown that such a *chromosome translocation*, as the phenomenon is called, can be detected in nearly all tumour cells from victims of Burkitt's lymphoma. Moreover, the breakpoint seems to be the same in most cases — a piece of the end of chromosome number 8 swaps positions with a piece from the end of chromosome 14. As it happens, chromosome 8 carries a proto-oncogene (a precancerous gene) very near the breakpoint. Jorge Yunis, a geneticist, speculates that the translocation has the effect of putting the proto-oncogene text to a DNA sequence that acts on adjacent genes to speed up their operation.

Contrary to the popular notion that cancer cells grow faster than normal cells, what actually happens is that cancer cells simply do not know when to stop growing. Unlike the cells that proliferate to heal a wound and then stop, cancer cells keep on proliferating. The key mutation is thought to be one that disables the cell's apparatus from knowing when to stop.

Although little is known yet about how oncogenes make cells cancerous, it is clear from the behaviour of cancer cells what special attributes they must have. The deadliest of attributes are those that distinguish a malignant cell from a benign one.

The Benign Ones: Benign tumours simply grow as a more or less spherical lump, pushing aside adjacent tissues or growing into natural openings. If these openings are essential to life, such as the trachea or a major blood vessel, they can be fatal. But if found early, benign tumours can be removed surgically and the patient totally cured.

More fearsome is the malignant tumour.

Instead of simply enlarging as a self-contained lump, it invades and destroys nearby tissues, wedges of malignant cells cutting into otherwise healthy organs.

Hippocrates was the first on record to recognise this difference between benign and malignant tumours, and the invasive wedges so reminded him of crab claws that he gave the disease the Greek name for the crab. In English the term survives as carcinoma or as the Latin word for crab, cancer.

The fact that malignant cells invade and benign cells don't is undoubtedly a result of the malignant cell having additional cancer genes at work. Even this ability, however, would not make malignant cancer so deadly. When cancer kills, it is most often because of the malignant tumour's added ability to detach individual cells and send them out to seed new tumours throughout the body.

This process, known as metastasis, requires first that a malignant cell synthesises enzymes and other factors that can, in effect, dissolve a hole in the blood vessel wall. This is an ability lacking in normal adult cells but present in some cells in embryos. These facts suggest that one of the mutations giving rise to malignancy must involve switching on embryo genes that are dormant in normal adult cells. With its passkey enzymes, the cell penetrates the blood vessel and drifts with the current.

Stomach Cancer. Researchers in both the West and the East have made significant strides in combating cancer during the last few years. A simple, quick stomach cancer detection method has been developed by a research group of gerontologists at a Japanese university.

The new method can detect stomach cancer in just 20 minutes after extracting a gastric juice sample from the patient, university sources announced in September 1985.

The method, capitalising on the conductive property of glycoprotein, makes it possible to detect 14 out of 15 patients, they said.

The index for glycoprotein electrical conductivity, called the isoelectric factor, is five in the case of a normal, healthy man, and 3.5 in a stomach cancer patient, it was found.

New Method. A new, promising method for treating cancer patients has been

developed at the Justus Liebig University in Giessen, W. Germany. Using a special catheter, tumours are flooded with high-dosaged drugs, so-called zytostatics. The blood is caught directly behind the carcinoma, purified and returned into the bloodstream.

This method, in which clinics in the U.S.A. are also interested, inhibits growth of the cancer and reduces the tumour in size without giving rise to the usual side-effects of these drugs. Moreover, tumours that are at first inoperable are so favourably influenced that they can subsequently be removed by operation.

Starve a Tumor. When a malignant tumor sets up camp somewhere in the human body, it requires a generous supply of blood in order to survive and grow. Cancer cells secure this supply by somehow encouraging angiogenesis, the proliferation of networks of tiny capillaries, which connect the incipient tumor to nearby arteries and veins. But what are the signals that entice the blood vessels to leave their established pathways and converge on a tumour? Scientists have sought the answer to that question for years. If such signals could be blocked, they reasoned, the tumor would no longer grow.

At Harvard Medical School, Bert Vallee, a professor of biochemical sciences, announced in October 1985 a major breakthrough in the study of angiogenesis. Vallee and his associates, together with scientists at the University of Washington, in Seattle, revealed that they had isolated and purified a protein that promotes angiogenesis. More important, they had cloned the protein's gene, a step that could ultimately enable scientists to produce the substance in large and pure quantities. While other angiogenic factors have been identified in the past, their genes have never been cloned.

Angiogenin. The protein, which the Harvard team named *angiogenin*, was isolated from human colon-cancer cells after a decade-long search. What partly slowed the quest was the fact that the protein is found in the body in only minuscule quantities. Even so, says Team Member James Riordan, angiogenin is so potent that it can induce blood vessels to form when it is

Early Detection

Early detection of cancer is the most effective way of fighting it. American Cancer Society recommends the following time table:-

- 1. For women between 20 and 65 (and those under 20 who are sexually active), the Pap test for cervical cancer may be done once every three years (after two negative tests a year apart).*
- 2. Women should have breast X rays, once between 35 and 40 to establish a reference, then at the advice of a physician until 50, and every year after 50. Women should continue to give themselves breast examinations each month.*
- 3. As Lung Cancer is still so resistant to cure, early detection by annual chest X rays or Sputum Cytology, an analysis of lung cells contained in sputum, is useless. Rather prevention, especially by avoiding smoking, is advised.*
- 4. Examination of the rectum and colon with a sigmoidoscope, is suggested every three to five years (after two negative tests a year apart) for people over 40.*
- 5. Annual guaiac slide tests on stool to detect intestinal bleeding should be done from ages 40 to 50.*
- 6. General checkup for cancer, including physical examination of the breasts and pelvis, testicles and prostate, thyroid, lymph nodes, mouth and skin, is suggested once every three years between ages 20 and 40, and annually thereafter.*
(Source: TIME.)

present in tissue as only one part per quadrillion.

Vallee's work was instantly hailed as a major step by Judah Folkman, a cancer researcher at Harvard who pioneered the study of angiogenesis. The prospect of learning to control the proliferation of blood vessels, Folkman says, has broad implications in the treatment not only of cancer but of many human ailments. For example, angiogenin might some day be

used to encourage the growth of new blood vessels in and around the heart after a heart attack. Stimulating the growth of capillaries

would also speed recovery from burns and other types of tissue damage.

(Source: Science '85, Time, Scala)

53. LASERS: THE HEALING BEAM

A laser can put a hole in a diamond in one-thousandth of a second, cut the cloth for 40 men's suits in an hour, surge through glass fibres while carrying 80,000 simultaneous telephone calls, and slice through a steel beam with an edge that never dulls.

Lasers—the light fantastic once only depicted in such futuristic epics as 'Star Trek'—have now taken on a number of real and versatile roles.

In medicine, there seems to be no limit to the laser as a surgical tool. It can blaze a tiny hole into a diseased eye to destroy overgrown blood vessels that block normal fluid drainage and cause glaucoma, vaporize a tumor deep inside the brain, cauterize a bleeding ulcer, and wipe away a tattoo or port wine stain birthmark.

The intensity of the laser light beam allows for non-invasive or least-invasive cutting of the tissue, coagulation of vessels, and sterilization. The laser can reach otherwise inaccessible parts of the body, thus eliminating the need for invasive surgery. The tool is highly accurate, causing little bleeding and little or no damage to surrounding areas and minimal scar tissue. Because of these qualities it has now become possible to repair many organs and leave them in place, rather than removing them.

In order to understand the functions of the laser in medicine, it is first necessary to understand the basic properties composing this energy source.

What is Laser? The word 'laser' is an acronym for *Light Amplification by Stimulated Emission of Radiation*. The laser functions by basic laws of light and electromagnetic waves, or radiation.

Light is composed of particles, called photons, which travel in waves, representing packets of energy. Photons are formed by activity within atoms.

Each atom has a positively charged nucleus with negatively charged electrons orbiting around it. When these electrons are in orbit close to the nucleus, the atom is

considered to be in a ground state, which is its lowest energy level. If the electron absorbs energy in the form of heat or light, the electron will travel to a higher orbit away from the nucleus, in a mode called a state transition.

Atoms in this excited state often return to the ground state. During this transition, energy is spontaneously emitted in the form of photons or light. When an electron moves to a higher orbit, it remains there only one-millionth of a second before returning to lower energy levels.

Einstein's Theory. In 1917, Albert Einstein explained that there was difference between spontaneous and stimulated emission of light. He postulated that, if electrons in higher orbits were bombarded by specific kinds of photons, they would decay to a lower energy level. Further, he added, a photon would be emitted in the process. The stimulating photon, instead of being absorbed, would continue to be reproduced. The end result is two photons with identical wave-lengths.

If enough of these excited atoms collide with the specifically correct photons, a chain reaction of stimulated emission of photons would occur. Thus, by exposing atoms to certain types of energy, such as a laser or electricity, and pumping them to higher orbits, a population inversion would occur.

Once this occurs, some atoms will begin to decay to lower levels, thus assuming a transitional state. Others will return to the ground state with spontaneous emission of photons. The spontaneously emitted photons will then collide with atoms in the transitional state, causing them to emit another photon. These photons then collide with more transitional atoms, and a chain reaction begins.

Lasting Effect. Although these photons—both emitted spontaneously and stimulated—are in the same wavelength, they may be travelling in different directions. Therefore, it is necessary to change this random directional movement to a parallel direction in order to form a laser, or fine beam. This process is called amplification.

Many different mechanisms can be used to produce this lasing effect. Each produces a different wavelength with a different absorption. The power source producing the laser effect is related to the composition of the medium.

The amplification of the stimulated emission occurs in a tube with mirrors placed on each end, called an optical resonator or laser cavity. Energy that goes to the side of the tube is lost, but photons travelling the length of the tube are reflected back through the medium. Each time the beam reflects back in this manner, additional atoms are stimulated to emit photons, amplifying the laser effect.

Wave Guides. In this optical resonator or laser cavity, one of the end mirrors has a small opening that permits a miniscule amount of the laser light to be transmitted. This transmitted light is controlled and aimed by a series of reflecting mirrors called fiber-optic wave guides. This laser light has particular qualities that distinguish it from conventional light sources.

- Laser light is all one frequency or wavelength and is one colour or monochromatic. This colour determines how it interacts with different types of tissues.
- The wavefronts of the laser beam are in coherence; that is, they are sustained over time in narrowly focused beams over long distances with little random movement or diversion. (Ordinary light, by contrast, is scattered and is made up of many frequencies)
- This coherence gives directionality—the ability of the beam to be precisely controlled and focused onto tissue substances.

Lasers may be operated with continuous or pulsed bursts of energy output. The number of pulses per second and the duration of the pulses vary depending upon the type of laser.

Power Density. The irradiance, or power density, is the amount of energy from

Memory Enzyme

Scientists have identified an enzyme in the brain which is responsible for long-term memory and theorise that one day they may be able to halt memory loss caused by aging and diseases such as Alzheimer's.

Researcher Gary Lynch said that he and his colleague Michel Baudry at the University of California Irvine have been able to alter the memory capacity of some laboratory rats but cautioned that scientists are still many years away from achieving similar results on humans.

Studies have shown that an enzyme called calpain is responsible for breaking down the proteins of brain cells, allowing them to form new connections. These new connections or new associations are what long-term memories are made of.

Calpain is not easily activated making the restruction of brain cells a slow process. For instance, if you repeat a person's name every day for a year, enough enzyme will eventually be released to create a long-term memory allowing you to remember that name 20 years later.

The enzyme can also be activated suddenly by heightened electrical activity when the brain is stimulated, allowing people to vividly remember many years later something that happened in only a few seconds.

Short-term memories are created by a different process in which connections or associations are modified only temporarily.

Restructuring of memory cells by calpain is irreversible, Lynch said. A person may not always be able to recall a long-term association or memory, but it is always there as the brain cells holding the association are intact.

Since the brain has billions and billions of memory cells, old memories are not destroyed to create new ones.

(UPI: August 26, 1985)

the laser directed on a square unit of tissue at a particular point of time. It is equivalent to the power output divided by the laser beam size; the smaller the beam, the higher the power density or irradiance.

When the power output is constant, the laser technician can vary the irradiance by shortening or lengthening the working distance. This reduces or enlarges the size of the contact spot. This spreading of the spot size with distance is known as divergence. As the divergence gets larger, the irradiance gets smaller.

The total amount of energy directed to the tissue during treatment is expressed in joules per unit surface area. Joules are calculated by adding the irradiance and exposure time.

The distribution of the power density across the beam path is known as traverse electromagnetic mode.

The basic modes have a bell-shaped distribution, with most of the energy in the center of the beam. The beams with multi-modes have more of the beam energy distributed near the outside and are effective for surgical use.

Absorption. Laser light is transformed to heat energy when it is absorbed by tissue, causing a thermal response. Laser light absorption is related to the wavelength of the beam and the absorption characteristics of the tissue. When the laser light comes in contact with tissue, part is reflected, part is absorbed, and part is transmitted until all of the energy is used. This reflection can be either specular or diffused. Specular reflection occurs when the angle of the reflection is equal to the oncoming light beam and can be used for directing the laser into hard-to-reach places. However, it may be dangerous if light is unknowingly reflected from polished surfaces or absorbed by normal tissue. Conversely, irregular surfaces can cause what is known as diffuse reflection, which has not direct tissue effect because it is not absorbed.

The absorption of laser light depends on the content of the tissue, such as hemoglobin

(blood), melanin (skin) or water—each having a specific absorption spectrum.

The tissue response is related to the colour (wavelength) of the laser light, among other factors. The primary colours of light are blue, green and red. The primary pigment colours are blue, green and yellow. Light of one primary colour will be absorbed by the other two.

In Medicine. There are basically three lasers currently in use in medicine: the Carbon dioxide (CO₂) laser, the argon laser, and the neodymium yttrium aluminium garnet laser (Nd: YAG). The light beam of each is a different wavelength, and the wavelength dictates different use. The different wavelengths are absorbed by various tissues or into different depths of tissue, which explains why, for example, a laser can pass harmlessly through the front of the eyeball, doing no damage, but can reach into the back of it and sear a hemorrhage shut.

The list for laser use will continue to grow as new technologies are developed and surgeons become proficient with their use.

Research is under way to develop laser technology for use in clearing out blocked arteries, making a coronary bypass unnecessary, and clearing out blocked arteries in the leg, avoiding amputation. Equally promising is a catheter to replace the standard gall-bladder operation, reducing post-operative risk and cutting surgical costs. Studies are now being conducted on a laser for cancer surgery where a dye is injected into a tumor to make it more sensitive to the laser without harming surrounding healthy tissue.

Studies are also being conducted in using lasers for intrauterine surgery to remove tumors from the fetus while in the womb. Occasionally, fetuses have tumors which enlarge as the fetus does, causing malformation of the fetus or premature labor. With lasers, it may be possible to divide abnormal connections to the normal infants, which would lead to shrinking or expelling of the tumor. (Source: USA Today, July, 1985)

SPECIAL FEATURE

BEYOND THE SPEED OF LIGHT

E. C. G. Sudarshan

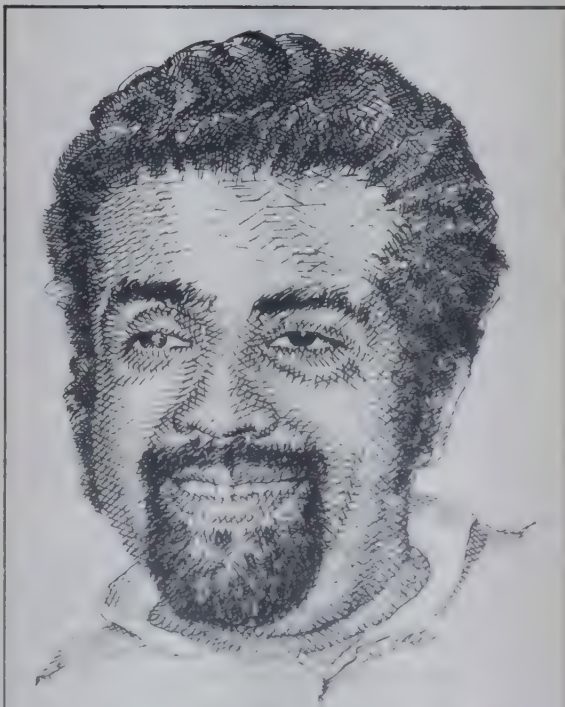
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India has all the ingredients for successful and leading Scientists' to arise from amongst our youth. My own assessment is that we are poised for remarkable advancements and there are many reasons to be optimistic. Only time will tell if we have the courage and 'sankalpa' ॥

After completing my post-graduate studies in Madras and teaching for one year in Madras Christian College, I joined the Tata Institute of Fundamental Research, Bombay as a Research Student in April 1952. Homi Bhabha was the shining light of TIFR whose scintillating brilliance was an inspiration in itself. I got to work under his guidance for a short time later on but I started my research studies in *Elementary Particle Physics* under the supervision of Bernard Peters. From Professor Peters I learned the need for painstaking and untiring work: he emphasized by example that working like a donkey would enable a person to make significant scientific contributions.

My special research problem was the use of the zig-zag scatter of the grains in the track of particles in special photographic emulsions to determine their masses. In the course of this work I learned a considerable amount of theoretical physics. In this the association with other scientists in Bombay like Raja Ramanna, Roy Daniel, Kundan Singwi, Damodar Kosambi, T. P. Srinivasan, Sibaprasad Misra, K. K. Gupta, K. G. Ramanathan and Sitarama Swamy was very helpful. It was an inspiring place; and yet one where I learnt about the cunning and greediness among scientists, some even good scientists.

Bhabha brought outstanding scientists like Dirac, Harish-Chandra, Goeppert-Mayer, Marshak, Mayer, Pauli, Stone and Tomonaga to teach at Bombay; so I had the opportunity to learn quantum mechanics from Dirac,



Prof. Sudarshan is the pride of India. He has established himself as one of the most distinguished theoretical physicists by advancing the theory of particles—tachyons—which could be moving faster than light. He is presently Director of the Institute of Mathematical Sciences, Madras. Here he recounts the course of his intellectual labour.

nuclear physics from Goeppert-Mayer, quantum theory from Pauli and many-body theory from Tomonaga. By volunteering to write notes of some of these lectures I got to know the lecturers very well. Imagine being able to talk for an hour or two everyday to Paul Dirac, probably the greatest physicist of our times!

Superb Teacher. Amongst these lecturers was Robert Eugene Marshak, Professor of Physics at the University of Rochester who had just completed a book on Meson Physics. He gave a few lectures on the physics of pions and nucleons. (Nucleons are the basic constituents of the atomic nucleus; and pions are produced in the collision of nucleons much like light is produced by electrons impinging on matter.) He was a superb teacher and made me understand for the first time the similarities between the pion-nucleon system and the light-atom system.

Marshak was very pleased with the work I had done regarding the notes and the rate at which I was able to absorb theoretical physics; so he asked me if I would like to join the University of Rochester for my graduate studies. It took me, thanks to the initial obstruction created by Professor Peters, two years to get to Rochester. This time was not wasted: I learnt some mathematics and more theoretical physics. (I even acted as Information Officer, Government of India abstracting journal articles to inform the research community in Bombay).

I joined the University of Rochester in the Fall of 1955 with my bride Lalita; she also became a graduate student at Rochester. It was a time of great ideas in theoretical physics: physics of the strong nuclear interactions was beginning to be understood quantitatively. Based on the Gell-Mann-Nishijima relation Gell-Mann gave a classification of the hadrons. The scattering amplitude considered as an analytic function of complex energy and momentum transfer gave new insights and the new tool of dispersion relations became available.

Abdus Salam, then a lecturer at Cambridge University came to lecture on this topic at Rochester; and I got to write his lecture notes. (Despite his brilliance his work was ignored at the High Energy conference;

and the University hostel was inhospitable to him, but it gave us the pleasure of having him as our house guest.) During discussions with Marshak and Salam I got my first new research problem on the magnetic moments and mass differences of hadrons. (I had already published some scientific papers in Bombay and one more in Rochester.)

Broken Symmetry. The first paper was written jointly by Marshak and myself. In the course of some further calculations that I had done Marshak noticed a peculiar regularity. In discussions between us and Susumu Okubo, a fellow graduate student, we found that this was a consequence of "broken symmetry", the first of its kind in Particle Physics.

The major focus of attention at this time was beta radioactivity and its possible generalizations. Beta radioactivity was discovered at the turn of the century and involves the spontaneous disintegration of the neutron into proton, electron and anti-neutrino; this new process was the result of a new force, different from the gravitational, electromagnetic and nuclear forces. Enrico Fermi, George Gamow and Edward Teller had developed a theoretical framework to study beta radioactivity two decades earlier. The discovery of parity violation in beta radioactivity by C. S. Wu and collaborators in the months following my reaching Rochester put a new emphasis on the study; and new data on other "weak" processes like muon and pion decay made it worthwhile to seek a "universal weak interaction".

Marshak suggested that I study this important problem and start by reviewing the work already done. It was already known that the decay of the pion into a muon and an antineutrino required that interaction had to be A or P from among the five possibilities S, V, T, A, P. But from beta decay data alone there was the delicate correlation between the electron emerging from the radioactive nucleus and the recoil of the nucleus; this "angular correlation" gave a rather paradoxical answer. From neutron decay and Ne^{19} decay it said either S, T or V, A. From He^6 decay it said T, A. A new experiment still being analyzed on A^{36} said V. But this set of deductions were intolerable since no satisfactory choice could be made.

We concluded that at least *one result had to be wrong*. The pion decay suggested a preference for A ; so we said He^6 must be wrong! With that proviso, the interaction was V, A uniquely.

Parity violation (nonequivalence of left and right handedness) experiments were consistent with our choice and gave the relative phase to be $V-A$. The electron always emerged left handed in these beta decays.

Endorsement. We also extended this to other weak processes like muon decay, pion decay and muon capture and to the decays of strange particles. The lesson was the same: not all experiments were consistent with each other and there could be no theory agreeing with all the experiments. We identified four experiments that were the best candidates for being in error and in need of being redone. These were:

1. Electron-neutrino correlation in He^6 decay.
2. Sign of positron polarization in muon decay.
3. Branching ratio of the electron and muon modes in pion decay.
4. Asymmetry from polarized neutron decay.

Fortunately for us all the experiments were redone within a period of eighteen months and the new results endorsed our $V-A$ theory.

This work was to have been presented at the VII Rochester Conference by me. But a few days before the conference Marshak told me that I could not present it since I was only a student; he could not present it since he was presenting another theory. So we requested Paul Mathews, then a Visiting Professor at Rochester to present it; he never did. It took another twenty-eight years before I got a chance to present it at an international conference (though I became an Assistant Professor within two years and a Professor within seven years! When people talk about science being universal and merit is its own reward, such cycle of events are inexplicable.)

Our work was presented by Professor Marshak at the Padua-Venice Conference in September 1957. (Many leading scientists were there but many have conveniently short memories!)

During the first week of July 1957 Marshak

invited me to join him for a lunch with Murray Gell-Mann and several other scientists. At this lunch I was asked by Marshak to outline our theory; Gell-Mann was very appreciative of our discovery. In September of the same year Richard Feynman and Murray Gell-Mann wrote a paper in which they too said, but without any analysis of data, that the interaction is $V-A$ and sought theoretical justification for it. This work which logically succeeds our work, done by two of the finest physicists gave the sycophant in physics the opportunity to club our works together or even to cite only their paper ignoring our earlier and more complete work.

Later Findings. Since 1957 there have been some advances in theory. The weak decays involving neutrinos in which the parent particle is "strange" is suppressed by an order of magnitude and this was parametrized successfully by Nicola Cabibbo in the framework of unitary symmetry. Later on following an analysis of the algebraic structure of the interaction by Sheldon Glashow and the use of spontaneously broken gauge theory by Steven Weinberg and by Abdus Salam, a unified electroweak theory has been constructed. The builders of this "upper storey" have been honoured by the award of the Nobel Prize.

My own scientific interests have spanned a wide spectrum, though primarily my work is in elementary particle physics and its theoretical scaffolding, quantum field theory.

Among the work that I have done is the examination of the consistency of faster-than-light propagation in the theory of relativity. This has become quite well known and such hypothetical particles are called tachyons.

Another such result is the Optical Equivalence Theorem. People had treated the optics of interference and diffraction on classical wave theory, but we know that quantum theory is the correct one. In a brief paper I showed by a simple mathematical analysis that for all these phenomena the two theories were identical and the differences were to be sought elsewhere. This was made possible by making a new display of the quantum electromagnetic field in terms of the "diagonal representation" ("Sudarshan representation").

Big Bang Theory Challenged

A widely held view, forming a basis for the accepted theories of universe evolution—that the present abundance of helium is the universe in predominantly the product of the primordial processes of nucleosynthesis soon after the Big Bang, billions of years ago—may now face a challenge from the observations made by the Infrared Astronomical Satellite (IRAS) flown by NASA in 1983.

The satellite has picked up images of a class of 'red objects' which are dust and gas-rich galaxies with very high luminosities. Their bolometric luminosities (total radiation in the entire electromagnetic spectrum which makes sense only in observations avoiding the atmospheric absorption, such as in satellites) have been found to be 10 to the power of 12 times the solar luminosity. IRAS has identified 10 such objects which radiate intensely in the

infrared wavelength regions of the spectrum.

"Genuine primordial galaxies" is what Prof. Geoffrey Burbidge of the University of California, San Diego, U.S., called them, describing one such object—NGC 6240—at the International Astronomical Union (IAU) meeting in New Delhi in Nov. 1985.

These are primordial only inasmuch as the galaxies, as seen today, seem to be in the stages of thermonuclear processes of nucleosynthesis characteristic of early universe, and are ejecting out large amounts, as much as 15 per cent, of helium. Otherwise, they are relatively new events compared to the age of the universe. The radiation is believed to be coming from the heating of the dust and the gas in the galaxy.

New Formalism. The proof that no action at a distance was possible between particles in a relativistic theory was proved by two of my students and myself using a new formalism. The development of this set of ideas was in collaboration with Narasimha Mukunda.

Scientific research for a theoretical physicist involves being conversant with new mathematical ideas (often at their cutting edge of research), experimental discoveries all over the world; and the work already done or being currently done. Much travel and international correspondence (and telephone calls!) are involved, yet it is an exciting life.

India has all the ingredients for successful

and leading scientists to arise from amongst our youth. But we need be willing to discriminate excellent work from mediocre work. We need to recognize that while the ideas and laws of science are universal, scientists are like other men with all their foibles and prejudices. In the light of this we should not be afraid to make our own decisions and not be camp followers, sycophants and chorus lines. If we do not seek excellence and assess our achievements, it is unjust and immoral to ask the nation to support us.

My own assessment is that we are poised for remarkable advancements and there are many reasons to be optimistic. Only time will tell if we have the courage and the *sankalpa*.

Part Two

*World
Panorama*

54. PRE-HISTORY

The beginnings of human civilization may be traced to our prehistoric anthropoid ancestors. The *Australopithecus* or Southern ape and similar other species of anthropoids built up the first civilization that we know of.

The culture that these species evolved through thousands of years is called Twilight Civilization because it represents the dim beginnings of human culture. This civilization is also known as Pebble Culture because the tools that they used were mostly pebbles flaked at one end to form cutting edges.

Paleolithic Age. The advent of *Homo Erectus** marks the beginning of the *Paleolithic or Old Stone Age*. The Paleolithic age is divided into three periods—the Lower, Middle and Upper Paleolithic. Several species of *Hominidae*** like the Java Man, Pekin Man, Rhodesian Man, Solo Man etc. flourished during the Lower & Middle Paleolithic periods.

The Upper Paleolithic opens with the advent of the ancestors of the modern man—some 30,000 years ago. The Upper paleolithic is sub-divided into 3 phases—the Aurignacean industry, ending about 18,000 B.C., the Solutrian industry, ending 16,000 B.C. and the Magdalian industry ending 10,000 B.C.

These people made significant advances, compared to their predecessors of the Middle Paleolithic period. Their implements, though still made of stone were more complicated, including knife blades, engraving tools of different types and beautifully carved harpoons. They made caves their habitation and buried their dead in them.

Though derided as 'cavemen' by the moderns, they acquired great skill in hunting and cooking. Their interests extended beyond the elementary needs of food and shelter to painting and sculpture. The paintings on the walls of the cave of Lascaux (France) are outstanding examples of their

artistic skill. They beautified themselves with necklaces and other ornaments and practised magic rites and ceremonies.

As the Pleistocene age drew to a close, the

Neolithic Culture in India

For the first time, archaeologists have struck a neolithic culture in Arunachal Pradesh, recovering various types of Stone Age artefacts.

The Stone Age tools have been recovered following a series of explorations and limited excavation in Parsiparlo and its neighbourhood in Subansiri district, according to Dr P.C. Dutta, director of the Union Territory's Research Directorate located in Shillong.

The archaeologists had explored a number of villages within 45 km radius of Parsiparlo where Stone Age civilisation flourished about 5,000 years ago.

Excavations carried out in the areas yielded stone polished axes, cylindrical stone hammers, typical lower Palaeolithic choppers, rectangular blades, ornamental scrapers, chisel and double edged blades.

The archaeologists in course of their exploration also located a huge quantity of raw material needed for manufacturing various tools and artefacts at Paleng 45 km west of Parsiparlo.

Among the villages explored Taba and Rigo were found to be comparatively more abundant in artefacts.

(UNI: Oct. 18, 1985.)

* See *Descent of Man* (supra)

** Ibid

The First Metal Discovered

It is commonly believed that Copper was the first metal that man discovered. But recent researches lead to the conclusion that the first metal to be discovered was lead. At the city site of Catal Huyuk in Asia Minor beads of lead have been uncovered that date back to 6500 B.C. Lead is derived from the natural ore, galena (lead sulfide). Lead can be melted from galena at temperatures below 800 degree centigrade. Ancient camp fires could easily have reached this degree of temperature, so that lead can very well be an accidental discovery, when a fire was lighted over a site of naturally occurring galena ore.

*Smelted copper appears much later on the archaeological scene. "The oldest example of smelted copper are from early 4th millennium levels at Tepe Yahya in Iran. Hence, it can be argued that the first metal smelted by man was lead with a margin over copper ore that on the existing evidence approaches 3000 years".**

*The existing evidence which the authors speak of, refers to the researches around the Aegean Sea which includes far flung areas like Iran, Iraq, Lebanon, Israel, Thrace and islands like Crete. A significant omission is the Indus Valley. Here a single cylindrical copper bead was discovered as early as 6000 B.C. by Gonzague Quivoru of the French Archaeological Mission.***

This is probably native copper, which is found in isolated groups on the surface of the earth. Native copper – copper unalloyed with other metals or other impurities – is a rare find. What is more, pure copper smelting calls for temperatures of around 1200°C., though copper ores like malachite or azurite will melt at a little more than 1000°C. Camp fires, which the ancients lit, hardly reached such high temperatures, though it is quite possible that some camp fires may go up to very high temperatures.

The ancients however had little use for copper, because it was neither strong nor hard enough to be useful for heavy work. But copper mixed with other metals makes bronze, which is hard and durable. So the possibility is that copper mixed with arsenic which forms a kind of bronze, was the first form in which man used it. Then followed the discovery of other metals like tin, antimony, and zinc. For, copper ore was often found mixed with these.

* Noel H. Tale & Zofia Stos-Gale in *Scientific American*.

** *Scientific American*.

Palaeolithic civilization died out and was replaced by the Mesolithic civilization.

Mesolithic Age. The Mesolithic Age or the Middle Stone Age (10,000 - 8,000 BC) came after the Paleolithic period. The Mesolithic people had to contend with a world, which was altogether different, geographically and biologically, from the world of their Paleolithic ancestors. In the cold north (Europe), most of the animals on which Paleolithic hunters lived had either migrated or become extinct. This compelled the Mesolithic people of the north to take to fishing to supplement their diet.

In the warm south (Middle East) the Mesolithic people gathered wild wheat and

barley, domesticated wild animals like dogs and took to breeding goats and sheep. It was these people who laid the foundations which were to revolutionise the Neolithic man's way of life—agriculture and stock breeding.

Neolithic Age or the New Stone Age (6,000 - 4,000 BC) is so named because man still relied mainly on stone-made weapons and tools, though the weapons and tools were much more developed and highly sophisticated. The Neolithic people inherited a comparatively advanced culture—the cumulative heritage of the Paleolithic and Mesolithic civilizations. They used ingenious tools and weapons and were masters of the art of domestication of animals. Nevertheless,

they remained essentially nomadic, wandering from place to place in search of food and pasture.

The basic discoveries of the Neolithic age are the domestication of animals, the cultivation of plants and the development of industries of pottery and weaving. The first animals to be domesticated were sheep, goats, cattle and pigs. In Europe, it seems that the dog was the first animal to cast in his lot with man. The ass was probably the first beast of burden. The horse was about the last to be tamed.

Agriculture. The discovery of agriculture meant that man ceased to be a wandering food gatherer. He became a food producer, tied down to land. Agriculture made it necessary to have new implements—the hoe, the plough and the scythe. Above all, it involved a settled life which meant permanent dwelling houses. The first houses were probably of reeds and skins. Then came wood and sun-baked bricks and stones. Pottery, a very early discovery, was revolutionised by the invention of the potter's wheel. Basketry and textiles developed more or less simultaneously. Textiles underwent speedy technological changes leading to the invention of the loom.

The industrial symbol of the Neolithic age

is the polished stone axe, which could be used for cutting trees and killing animals and for fighting against human enemies as well. The Neolithic period witnessed the making of highly sophisticated implements—polished stone axes with handles, knives, daggers, arrow heads, battle axes; reaping knives, bone and ivory needles, pins, combs etc. This age merged slowly and imperceptibly into the Chalcolithic age.

Chalcolithic Age or the Copper Stone Age (4,000 - 3,000 BC) is so called because during this age copper was discovered and put to use along with stone artifacts. This was also the age when the first great civilizations took shape. During this period, permanent settlements were established in the valleys of the Indus, the Euphrates and Tigris and the Nile.

Copper not being available everywhere, it became necessary to transport it over long distances. Means of transport had therefore to be devised. The ox and the pack ass were too slow and too clumsy for long distance transport. The wheeled cart and the sailing ship therefore came into vogue. It was only a matter of time before the horsedrawn chariot appeared. The stage was set for the emergence of the great civilizations of the Indus Valley, Sumeria, Egypt, Crete, Mycenae, Anatolia, Iran and China.

55. FIRST GREAT CIVILIZATIONS

Civic society or organised socio-political civilization first took shape within a narrow geographical compass that covered Egypt in the west, Indus Valley in the east, Anatolia (Asia Minor) in the north, and Sumeria (Iraq & Iran) in the south.

Civilization radiated outwards from these centres, reaching the Mediterranean sea board and the islands in the west, and China in the east, around 2000 B.C.

The first cities were very small affairs centred around temples. The highpriest of the temple was also the chief of the city. Very soon some temples became more prominent than others and the highpriests of these temples became the first among city chiefs, or in other words, kings. Being extremely limited in territorial area, these embryonic states were little more than city states.

Among the earliest of such states were those of the Indus Valley, Sumer and Egypt.

Indus Civilization. The Indus Civilization is the last of the great civilizations to be discovered. Though a late-comer to history books, the Indus civilization is the oldest of the first great civilizations known. Recent researches at Mehrgarh and other sites in the Indus Valley indicate that the Indus Civilization had its beginnings between 7000 and 6000 B.C. Carbon-14 analysis has shown that the later structures at Mehrgarh belong to the 6th millennium B.C.

The Indus Script

Two interpretations regarding the Indus script are reproduced below. They show the great divergence of views among scholars in this regard. Both were reported in 1980.

I

Soviet experts have cracked the Indus Valley script. They claim that the script resembles a Dravidian language, akin to Tamil, Malayalam or Kannada.

Describing it as a fundamental discovery, the experts say that the script of the civilisation, which existed around 2500 B.C., is completely indigenous and original and that it was not brought from outside.

The experts say that the script has no connection with the Sumerian civilisation of West Asia or with the Egyptian Hieroglyphics.

The script, however, has been found on 800 seals in West Asia – a good evidence of a flourishing trade between these two civilisations.

The work of deciphering the script has been disclosed in a recent report in Izvestia, and quoted by a British newspaper. The discovery is attributed to Prof. Knorozov and his team of the Soviet Institute of Ethnography.

Using computers, the team has acquired the capacity to read the existing texts, except some portions.

Another interesting finding is that the Indus Valley had a wonderful system of recording cycles of time taking into account the movements of the Sun, the Moon and Jupiter. The people of the valley knew even in the third millennium B.C., how to calculate the time taken by Jupiter to go round the Sun.

II

From his meticulous analysis of the Indus script and language Dr. S. R. Rao, eminent archaeologist, has asserted that it would be illogical to maintain that the Indus civilisation was destroyed by invading Aryans.

Mr. Rao described the Indus script as of Indo-European class and not of Dravidian origin as popularly believed so far. He emphasised that it was the Indus people who laid the foundation of the Vedic society.

After reading nearly 1800 seals of the Harappan culture, Mr. Rao has come to the conclusion that the Harappans not only spoke an Indo-European language but also observed religious rites which were later adopted by the Aryans.

He said the Indus language was an earlier form of the language of the Rigveda. Harappan seals, which speak of rulers and holy men, also appeared in the Rigveda and Vedic literature later.

Mr. Rao was confident that it was not the so-called Aryan invaders who destroyed the Indus civilisation as believed earlier, but perhaps the floods of the Indus river. He was also assertive that it had no link with the Dravidian languages as was earlier believed by scholars, including those in the USSR, who had conducted a computerised study of the Indus script and language.

Earlier structures must therefore belong to a period prior to BC 6000.

It is not known who the builders of the Indus civilization were. In all probability, they were a Mediterranean race, allied to

the Dravidians of India. Nor do we know very much of this civilization as the Indus seals still remain undeciphered (see Box) But the artifacts that have been found and the structures that have been unearthed indicate

a level of civilization no whit behind the fabled civilizations of Sumeria and Egypt. A strange thing about this civilization is that it disappeared suddenly. What caused this sudden disappearance is still a mystery (see Part III, India).

Sumeria. Sumeria was in the lower valley of the Euphrates and Tigris, in the southern half of Mesopotamia. We do not know who the Sumerians were. They were a broadheaded race, thickset and short in stature with fleshy faces and big noses prolonging the line of the forehead without any intervening depression. Their eyes were widely set apart and slanting. They have been compared by some to the Turanians of today and by others to the Dravidians of India.

Sumeria had a hectic history. The original Sumerians were overwhelmed by a number of foreign conquerors, through successive centuries – the Akkadians, Babylonians, Assyrians, Chaldeans etc. But all through these conquests and turmoil, the old Sumerian civilization remained intact, being supplemented and reinforced by the conquering races.

Egypt. The racial origin of the Egyptians is also a matter of dispute. Some regard them

as a conquering Asian race acquainted with metallurgy and armed with superior weapons, who easily triumphed over the tribes inhabiting the Nile Valley in neolithic times. The history of Egypt, unlike that of Sumeria, was more or less smooth. Except for the invasion of the Asian tribe Hyksos in 1790 B.C. and their occupation of Egypt till 1573 B.C. Egypt was ruled by a succession of indigenous dynasties, under whom the old Egyptian civilization grew up to its full dimensions.

On the whole, the Indus, Sumerian and Egyptian civilizations remain the supreme human achievements of the 4th millennium B.C. Once started, civilization continued to expand. Around 2000 B.C. the Phoenicians settled on the Syrian coast and laid the foundation of a maritime empire in the Mediterranean.

Hittites established a kingdom in Asia Minor which later expanded eastwards and southwards. At Mycenae (Greek mainland) and Crete and adjoining islands, other tribes about whom also we know very little, built cities that rivalled those of Sumeria and Egypt in splendour.

56. OUTLINE OF HISTORY

The great Civilizations of Sumeria, Egypt and the Indus Valley open the long and chequered history of mankind. An outline of that history through the ages, from the early civilizations to the two World Wars, is given below in the chronological order.

B.C. 6000: Neolithic settlements at Mehrgarh, Baluchistan in the *Indus Valley*; Sun-dried brick houses; Domestication of cattle, water buffalo, sheep and goats; Cultivation of wheat and barley; Copper known. 5000: Development of farming in the Indus Valley – several varieties of wheat and barley/fruit trees; jujube and date-cultivation of cotton; pottery and beads.

Neolithic settlements in *Sumeria*; domestication of animals; Beginnings of farming; Neolithic settlements in *Egypt*. 4000: Invention of potter's wheel and bow drill in *Indus Valley*; kilnfired pottery; red painted wares; beads of local stones and imported turquoise – copper melting (see Part III India). Susa

founded in *Sumeria*; White painted pottery in *Egypt* and development of farming.

Writing. 3500: Growth of pottery in *Indus Valley*; several varieties; egg shell thin goblets; vitrified decorated wares; beads of lapis lazuli, turquoise and carnelian; Sumeria develops cuneiform (wedge-shaped) writing; Sumerian temples at Eridu, Ur and Uruk; Potter's wheel in use in Sumeria.

3000: Copper alloys in *Indus Valley*; bronze in use; cultivation of wine grape; First dynasty at Ur in Sumeria; Wheeled vehicles in use; linen produced; King Menes the Fighter unites Upper and Lower Egypt; *Phoenicians* settle on the Syrian coast with

centres at Tyre and Sidon; Early Minoan civilization in Crete.

2980: Memphis made the capital of Egypt; Pharaoh god-king. 2870: Beginnings of Trojan culture in Asia Minor. 2850: Traditional beginnings of civilized life in China. 2650: The first pyramid (stepped pyramid) built in Egypt. 2500: Sixth dynasty in Egypt; Collapse of the Old Kingdom; Dominance of the Ur dynasty over all Sumeria; Sumerian numerical system based on 6 and 12; Lunar calendar 360 degrees in a circle, 60 minutes in an hour, 60-second minutes in a minute etc.)

Calendar. Egypt introduces calendar of 365 days without adjustments; Egyptians discover use of papyrus; Equinoxes and solstices determined in China; Beginnings of astronomical observations in Sumeria, India, Egypt and China. Harappan civilization in Indus Valley (see Part III India).

2370: Sargon, King of the Akkadians (a Semitic tribe), conquers Sumeria and Elam and makes Agad his capital. 2200: Traditional beginnings of the Hsia dynasty in China. 2100: Abraham leaves Ur in Chaldea. 2000: Kingdom of Elam attacks Akkadia, destroys the capital Agad and annexes the kingdom of Sumer. Hittites, an Indo-European tribe, establish a kingdom in Asia Minor (Anatolia). Middle Minoan period in Crete. Mycenae in Greece becomes a centre of civilization. Aryan settlements in India; Vedic civilization takes shape; The composition of the Rig Veda.

1995: Amenemhet founds the 12th dynasty in Egypt. 1990: Babylonians conquer the whole of Mesopotamia, including Assyria (northern Mesopotamia) and Elam (eastern Iran).

1800: Hammurabi, the Babylonian Emperor, proclaims a code of laws. 1790: Hyksos, an Asian tribe, dispossesses the 13th dynasty and occupies Egypt. 1760: Shang dynasty begins in China. 1595: Hittites overthrow Babylon. 1580: Cretan civilization at its height. Jews enslaved by Egypt. 1573: Hyksos, the shepherd kings, driven out of Egypt.

Mycenaean. 1500: Flowering of Mycenaean civilization in Greece. 1480: Moses leads Jews out of Egypt. 1400: Mycenaeans destroy Knossos palace at Crete. Decay of Cretan civilization. 1380: Amenhotep (Amenophis IV) revolutionises Egyptian religion and proclaims a new religion. 1362: Rebel-

lion in Egypt: Egypt loses her outer possessions.* 1345: 19th dynasty in Egypt: Egypt recovers her former power. 1250: Assyrians conquer Babylon.

1200: Philistines (Phoenicians) from north Mediterranean occupy Palestine. Etruscans, an Asian people, settle in Italy. Homeric siege of Troy by Greeks (?). Downfall of the Hittite Kingdom. 1027: Chou dynasty begins in China.

1013: Rise of the Israelites in Palestine. David (1013-973) establishes Israelite hegemony. 1000: Egypt ceases to be a power. Epic civilization in India - composition of the great epics, Ramayana and Mahabharata. Phoenicians develop alphabetical writing.

Old Order Changeth. 850: Phoenicians found the city of Carthage on the northern coast of Africa. 753: Traditional foundation of the city of Rome. 745: Assyrian Empire at its height. 621: Draco publishes Athenian laws† 612: Nineveh, the capital of the Assyrian Empire, destroyed by a combination of Babylonians, Scythians and Medes.

610: Ionian (Sanskrit *Yavana*, Persian and Arabic *Yunani*) city states on the west coast of Asia Minor. 604: A new empire in Mesopotamia with Babylon as capital. 594: Solon reforms Athenian constitution. 586: Babylonians capture Jerusalem. 560: Croesus, reputed to be the richest king of his times, rules Lydia. Lydians issue the earliest known systematic currency.

538: Cyrus founds the Persian Empire and captures Babylon. 509: Traditional foundation of the Roman Republic. 490: Battle of Marathon; Athenians defeat Persians.

Buddha. 483: Death of Buddha in India. 480: Battle of Thermopylae - Spartans under Leonidas wiped out by Persians; Battle of Salamis (naval battle) - Athenians under Themistocles rout the Persians. 479: Battles of Plataea and Mycale - Greek victories over Persia by land and sea respectively; Athenian supremacy in Greece begins; Final end of Persian threat; Death of Confucius in China.

461: Pericles comes to power in Athens. 431: Outbreak of Peloponnesian War be-

† A stiff code of conduct with severe punishments for minor breaches - hence the term *draconian*.

tween Athens and Sparta. 425: Death of Herodotus. 404: Athenians surrender to sparta; Beginning of Spartan supremacy in Greece. 399: Execution of Socrates. 371: Battle of Leuctra – Thebans defeat Spartans and become the leaders of Greece; Theban hegemony.

347: Death of Plato. 338: Battle of Chaeronea; Philip II of Macedon defeats the Greek city states and becomes supreme in Greece.

Alexander the Great. 336: Alexander becomes the King of Macedon. 334: Battle of Granicus; Alexander's first victory over the Persians. 333: Battle of Issus; Alexander's second victory over Darius of Persia.

332: Alexander captures Tyre and occupies Egypt. 331: Battle of Arbela (Gaugamela); Alexander finally defeats Persians. 330: Death of Darius and the end of Persian Empire. 326: Battle of Hydaspes; Alexander defeats Porus of India and conquers the Punjab. 323: Death of Alexander at Babylon; Ptolemy I founds dynasty in Egypt; Alexandria (in Egypt) becomes the intellectual centre of the world.

321: Chandragupta Maurya establishes the Mauryan Dynasty in India; Death of Aristotle. 312: Seleucus I founds dynasty in Asia. 275: Battle of Beneventum; Rome finally defeats Pyrrhus and becomes undisputed master of all Italy.

Emperor Asoka. 274: Asoka becomes Emperor of India. 264: Beginning of the First Punic War between Rome and Carthage. 241: End of the First Punic War; Sicily becomes the first province of Rome. 221: Shih Huang Tih completes conquest of all Chinese states. 218: Beginning of the Second Punic War; Hannibal, the Carthaginian general attacks Rome.

214: The construction of the Great Wall of China. 213: Burning of Chinese classics. 212: Romans capture Syracuse; Archimedes killed. 202: Eastern Han dynasty in China; Hannibal defeated by the Roman general, Scipio Africanus. 201: End of Second Punic War; Rome dominates western Mediterranean. 196: Rome conquers Macedon and Greek city states. 160: Judas Maccabaeus leads successful revolt against the Seleucid dynasty. 149: Outbreak of Third Punic War.

146: Romans invade Carthage and make it a Roman province. 124: Establishment of a college in China to train civil servants. 110: China under Emperor Wu Ti expands towards south east. 106: Marius and Sulla become Roman leaders. 88: Civil war between Marius and Sulla begins.

Julius Caesar. 60: The formation of the First Triumvirate; Pompey, (Julius) Caesar, Crassus. 58: Caesar begins conquest of Gaul. 55: Caesar's conquest of Britain. 53: Crassus, defeated by Persians, falls into disgrace in Rome. 49: Caesar crosses the Rubicon and challenges Pompey. 48: Battle of Pharsalus; Caesar defeats Pompey. 46: Caesar reforms the calendar, later known as the Julian Calendar. 44: Murder of Caesar.

43: The formation of the Second Triumvirate; Antony, Octavian (Augustus), Lepidus. 42: Battle of Philippi; Antony and Octavian defeat Brutus and his associates. 31: Battle of Actium; Octavian defeats Antony and Cleopatra and becomes the master of the Roman Empire. 27: Senate of Rome confers the title of *Augustus* on Octavian; Octavian becomes *Caesar Augustus*.

Christ is Born. 4: Birth of Jesus Christ*.

A.D. 6: China institutes Civil Service Examination. 14: Augustus dies. 25: Beginning of Later Eastern Han dynasty in China. 29: Crucifixion of Christ. 63: Death of St. Paul. 64: Great Fire of Rome. 68: Death of Nero. End of Julio-Claudian line of Roman emperors. 70: Emperor Titus suppresses Jewish revolt and destroys Jerusalem.

79: Vesuvius volcano erupts and destroys the famous Roman towns of Pompeii and

* Dating 4 B.C. as the year of Christ's birth has always been a matter of dispute among chronologists and hence it is given with a question mark. Christian Era commenced on January 1, 754 AUC (ab urbe condita – "from the foundation of the city (of Rome)")

Christ's birth was believed to have occurred on December 25. Immediately preceding years are reckoned as B.C. (Before Christ) and A.D. (Anno Domini – in the year of the Lord).

Chronologists admit no year zero between 1 B.C. & A.D. 1

Dionysius Exiguus, the Scythian monk who invented A.D. reckoned the birth of Christ to have occurred in 753 AUC, but Christ was born under Herod the Great according to the Gospels, i.e., at the latest in 750 AUC.

This dating though disputed has continued in use to the present day and, as a result, the Nativity is reckoned to have taken place in or shortly before the year 4 B.C. when Herod died.

Colosseum. 80: Completion of the Roman Colosseum. 96: Accession of Nerva, the first of the "Five Good Emperors". 97: Chinese penetrate into Persian Gulf. 117: Death of Arajan and the accession of Hadrian; Roman Empire reaches its greatest extent.

180: Death of Marcus Aurelius, last of the "Five Good Emperors"; Beginning of the decline of the Roman Empire. 212: Emperor Caracalla gives Roman citizenship to all the free citizens of the empire. 220: Han dynasty ends in China; Period of Civil War in China begins. 230: Emperor Sujin in Japan organizes a Japanese empire. 251: Goths defeat and kill the Roman emperor Decius.

284: Diocletian becomes emperor of Rome; persecution of Christians reaches its climax. 306: Constantine becomes emperor. 313: Edict of Milan gives tolerance to Christians in the Roman empire. 320: The Gupta dynasty rises in India. 325: The Council of Nicaea, first General Council of the Christian Church.

Roman Empire Declines. 378: Battle of Adrianople; Goths defeat and kill Eastern Roman Emperor Valens. 395: Death of Emperor Theodosius the Great: Final division of the Roman Empire into Eastern and Western empires.

410: Alaric the Goth captures and destroys Rome. This is taken to be the end of the Roman Empire. 415: Visigoths begin conquest of Spain. 429: Vandals begin conquest of North Africa. 452: Attila invades Italy. 455: Rome pillaged by Vandals. 476: Romulus Augustulus, the last Western Roman emperor, deposed by Odovacar; The end of Western Roman Empire.

481: Clovis becomes the King of Franks and occupies Gaul. 493: Theodoric founds Ostrogothic Kingdom in Italy. 527: Accession of the Eastern Roman Emperor Justinian I. 529: Publication of the Civil Code by Justinian. 538: Justinian builds the famous Christian church Hagia Sophia at Constantinople.

Rise of Islam. 570: Birth of Mohammed. 589: Reunion of China under the Ch'en dynasty. 605: Grand Canal of China constructed. 618: Tang dynasty comes into power in China. 622: Hejira or flight of Mohammed from Makkah to Medina; Beginning of the Mohammedan era. 632: Death of Moham-

med; Accession of Abu Baker, the first Caliph.

636: Muslims occupy Damascus. 638: Muslims capture Jerusalem. 641: Persia conquered by Muslims. 643: Muslims occupy Alexandria. 698: Muslims invade Carthage. 711: Muslims spread into Spain. 718: The greatest Muslim attack on Constantinople fails. 732: Muslim advance in Spain halted by Charles Martel. 750: Beginning of Abbasid Caliphate (replacing Ommayyads).

786: Accession of Haroun-al-Rashid in Baghdad. 800: Coronation of Charlemagne as Holy Roman Emperor. 814: Death of Charlemagne and the division of his empire. 827: Muslims invade Sicily. 840: Muslims capture Bari and occupy Southern Italy.

Verdun Treaty. 843: Treaty of Verdun; Final division of the Carolingian Empire founded by Pipin, King of France, in A.D. 751; Beginning of France and Germany as separate states. 862: Rurik founds Viking state in Russia, first at Novgorod, later at Kiev. 866: Fujiwara period begins in Japan. 868: The first printed book in China. 893: Simeon founds first Bulgar Empire in Balkans. 899: Death of Alfred the Great in England.

900: Ghana in North West Africa at the height of its power. 912: Accession of Abder Rahman III; The greatest period of the Ommayyad Caliphate of Cordova (Spain). 955: Battle of Lechfeld; Magyars, finally defeated by Otto the Great, settle in Hungary. 960: Beginning of Sung dynasty in China. 966: Mieszko I, King of Poland, accepts Christianity. 968: Fatimids begin their rule in Egypt. 982: Norsemen discover Greenland. 987: Hugh Capet, King of France, founds Capetian dynasty. 993: Olof Skutkonung, King of Sweden, converted to Christianity. 998: Vladimir, King of Kiev, becomes Christian.

1000: Leif Ericsson discovers North America. 1016: Canute becomes King of England. 1066: William I, Duke of Normandy, conquers England. 1069: Reforms of Wang-An-Shih in China. 1071: Battle of Manzikert; Seljuks destroy Byzantine army. 1073: Gregory VII becomes Pope. 1075: Seljuk Turks capture Jerusalem. 1086: Compilation of Domesday Book in England.

Crusade. 1095: Council of Clermont; Pope Urban II preaches First Crusade. 1099:

First Crusade under Godfrey of Bouillon takes Jerusalem. 1135: Stephen becomes King of England; civil war with Matilda; anarchy follows. 1143: Alfonso Henriques becomes first King of Portugal. 1144: Muslims capture Christian stronghold of Edessa. 1148: Second Crusade fails to capture Damascus. 1152: Accession of Emperor Frederick Barbarossa. 1154: Henry of Anjou establishes the Plantagenet dynasty in England. 1161: Explosives used in warfare in China. 1176: Battle of Legnano; Frederick Barbarossa defeated by the Lombard League; Italian states become autonomous. 1185: Kamakura period in Japan; Epoch of feudalism in Japan which lasts until 1333.

1189: Third Crusade under Frederick Barbarossa, Philip Augustus of France and Richard the Lion Heart of England. 1191: Crusaders capture Acre. 1192: End of the Third Crusade without regaining Jerusalem. 1204: Fourth Crusade captures Constantinople. 1206: Jengiz Khan becomes King of the Mongols and overruns Central Asia. 1212: Battle of Las Navas de Tolosa; Spaniards win decisive victory over the Muslim Moors.

Magna Carta. 1215: Fourth Lateran Council; Papal authority reaches its zenith; Magna Carta in England. 1237: Mongols invade Russia. 1241: Mongol incursions into Central Europe. 1260: Kublai Khan rules in China. 1284: Edward I of England conquers Wales. 1291: The League of Uri; Beginnings of the Swiss Confederation; Acre falls to Muslims; Crusades end. 1309: Papacy moves to Avignon; Beginning of the *Babylonish Captivity*. 1314: Battle of Bannockburn; Robert Bruce of Scotland defeats the English army. 1336: Ashikaga period in Japan.

1338: Beginning of the Hundred Years' War between England and France. 1346: Battle of Crecy; English victory over the French and the Scots. 1348: Black Death reaches Europe. 1356: Battle of Poitiers; Black Prince of England defeats the French. 1360: Peace of Bretigny; Edward III of England gains territories in France. 1362: English made the official language in England. 1363: Timur (Tamerlane) begins his career of conquest in Asia. 1368: Ming dynasty in China. 1377: Pope returns to Rome; End of Babylonish Captivity.

Peasants Revolt. 1381: Peasants Revolt in England. 1398: Timur invades North

India. 1415: Battle of Agincourt; Henry V of England gains a decisive victory over France. 1429: Joan of Arc leads the French army and takes Orleans. 1431: Joan of Arc burnt at stake as a witch. 1438: Albert establishes the Hapsburg dynasty. 1453: Turks capture Constantinople and end the Byzantine or the Eastern Roman empire; End of the Hundred Years' War.

1455: First battle of St. Albans; Beginning of the Wars of the Roses in England. 1469: Marriage of Ferdinand of Aragon with Isabella of Castile and the formation of the modern kingdom of Spain. 1485: Battle of Bosworth Field. Beginning of Tudor period in England.

Colonisation. 1488: Bartholomew Diaz rounds Cape of Good Hope. 1492: Christopher Columbus discovers the West Indies; Spain captures the last Muslim stronghold in Europe. 1497: John Cabot discovers Newfoundland.

1498: Vasco da Gama reaches Calicut by sea. 1499: Amerigo Vespucci charts part of the South American coast. 1500: Pedro Cabral discovers Brazil. 1517: Martin Luther begins Reformation; Turks conquer Egypt. 1520: Suleiman the Magnificent becomes Sultan of Turkey; Turkish power at its height. 1521: Cortes conquers Mexico. Turks capture Belgrade. 1523: Swedes expel Danish overlords and elect their own king.

Mughul Empire. 1526: Battle of Panipat; Babar founds Mughul Empire in India. 1532: Francisco Pizarro conquers Peru. 1533: Ivan IV (the Terrible) becomes Czar of Russia. 1534: Act of Supremacy; Henry VIII assumes control over English Church. 1542: First Portuguese sailors reach Japan. 1545: Opening of the Council of Trent.

1556: Akbar becomes Mughul Emperor. 1557: Macao becomes permanent Portuguese port in China. 1558: Elizabeth I becomes Queen of England. 1577: Drake begins voyage round the world returning by 1580. 1579: Union of Utrecht; Formation of the modern Dutch state. 1582: Pope Gregory XIII introduces (New style) Gregorian Calendar. 1585: Hideyoshi, dictator of Japan, unifies the country.

1588: English defeat the Spanish Armada. 1598: Edict of Nantes; French Protestants

given liberty of worship; End of French Wars of Religion. 1600: English East India Company formed. 1602: Dutch East India Company founded. 1603: Union of English and Scottish Crowns; James VI of Scotland becomes James I of Britain. 1605: Gun powder plot.

1611: Publication of the Authorised Version of the English Bible. 1613: Michael Romanov becomes Czar of Russia and establishes the Romanov dynasty. 1620: Pilgrim Fathers settle in New England. 1624: Richelieu becomes Chief Minister in France. 1628: Petition of Rights in England. 1636: Japanese forbidden to go abroad. 1641: Japanese exclude all foreigners from Japan, except small Dutch trading ships. 1642: Outbreak of the English Civil War between Royalists and Cavaliers. 1644: Ching dynasty (Manchu) in China.

Cromwell. 1649: Charles I of England executed; Cromwell becomes Protector of England. 1652: The Dutch establish Cape Colony. 1660: Restoration of monarchy in Britain. Charles II founds the Royal Society. 1661: Mazarin, who succeeded Richelieu as Chief Minister of France, dies; Louis XIV takes over the government in person.

1665: Great Plague of London. 1666: Great Fire of London. 1688: Glorious Revolution in England; James II abdicates the British throne. 1689: Bill of Rights in England. 1694: Founding of the Bank of England. 1696: Peter the Great becomes Czar of Russia. 1701: War of Spanish Succession begins. Duke of Marlborough leads the English army on the continent. 1704: Marlborough wins the Battle of Blenheim.

1721: Robert Walpole becomes the first Prime Minister of England. 1739: Nadir Shah of Persia sacks Delhi; War of Jenkins' Ear begins between Spain and Britain. 1740: Frederick the Great becomes King of Prussia. Maria Theresa succeeds to the Austrian throne. Beginning of the War of Austrian Succession. 1751: Clive takes and holds Arcot in India and checks French advance; Chinese conquest of Tibet.

1756: Seven Years' War begins. 1757: Clive conquers Bengal. 1760: Battle of Wandiwash; the English defeat the French in India. 1762: Catherine II becomes Czarina in Russia. 1770: James Cook discovers New South Wales. 1773: "Boston Tea Party". 1776: Amer-

ican Declaration of Independence. 1787: The drafting of the American Constitution.

French Revolution. 1789: French Revolution begins; Storming of the Bastille (July 14); George Washington becomes the first President of USA. 1792: France becomes a Republic. 1793: Louis XVI beheaded. 1794: Fall of Robespierre in France. 1795: Napoleon Bonaparte disperses Paris mob (Oct. 5).

1796: First Italian campaign of Bonaparte. 1798: Battle of the Nile. 1804: Bonaparte becomes Emperor. 1805: Battle of Trafalgar and Nelson's death; Battle of Austerlitz (Dec. 2). 1807: Napoleon controls all Europe; Slave trade abolished in British Empire. 1808: Peninsular War begins. 1812: Napoleon's retreat from Moscow.

1815: Battle of Waterloo, Napoleon sent to St. Helena. 1823: President of USA announces "Monroe Doctrine." 1832: First Reform Bill in England. 1833: First British Factory Act. 1837: Queen Victoria succeeds to the British throne. 1840: Introduction of the penny postage in England (see Box). 1846: Repeal of the Corn Laws and the resignation of Peel.

Marx & Engels. 1848: Louis Philippe of France abdicates; Second French Republic proclaimed; *Marx and Engels publish the Communist Manifesto*; Gold discovered in California. 1849: Britain annexes the Punjab. 1851: Submarine telegraph cable between Dover and Calais; Discovery of gold in Australia.

1852: Napoleon III becomes Emperor of France. 1853: Commander Perry lands in Japan. 1854: Crimean War. 1856: Livingstone completes journey across Africa. 1857: First war of Indian Independence. 1858: British Crown assumes Government of India.

1861: Abraham Lincoln becomes President of United States; American Civil War. 1862: Bismarck becomes the Chief Minister in Prussia.

No to Slavery. 1865: Abolition of Slavery in USA; Assassination of Lincoln. 1867: Dominion of Canada established, Russia sells Alaska to America; Second Parliamentary Reform Bill in England. 1868: Shogunate abolished in Japan; Meiji period of rapid westernisation under imperial leadership begins.

The Penny Postage

One hundred and forty-five years ago, on May 6, 1840, world's first adhesive postage stamp, the "Penny Black" was released by the British Post Offices. Though "Penny Black" is just a bit of paper, printed with a black motif of queen's head, it has its own beauty and charm and is a possession to show off. It heralded the arrival of a new era in the history of communication. Not only did it ease the hazards of collecting 'postage' but also revolutionised the communication system.

The suggestion of Uniform Postage met with heavy opposition in the British Parliament. Later it was reluctantly accepted and on January 10, 1840 'Penny Post' come into usage.

The credit for this innovation goes to Rowland Hill (1795-1879) who was a member of the Society for Popular Education in England. The story goes that one day travelling through a small village in Scotland, he saw a poor girl refusing a postal letter, because she had no money to pay the postage. Hill paid the postage. This was the immediate incentive for his pamphlet on Postal Reforms in 1836. At the time, postage was computed on the basis of the weight of the letter, that is, the number of sheets and the distance. Hill opposed the system of increasing the postage according to distance, because it caused great hardship to the poor. His proposal was finally accepted and passed into law. He is now rightly known as the 'Father of the Penny Postage'.

1869: Opening of the Suez Canal. 1870: Promulgation of the Doctrine of Papal Infallibility. 1871: Franco-Prussian War, Defeat of France by Prussia; Trade Unions in Britain legalised. 1874: Disraeli succeeds Gladstone as Prime Minister. 1875: England purchases Suez Canal shares. 1878: Second War with Afghanistan ended. 1884: Third Parliamentary Reform Bill in England.

1886: Britain annexes Upper Burma; Completion of Canadian Pacific Railway; Discovery of gold in Transvaal. 1894: Japan declares war on China. 1895: Japan occupies Formosa and Korea. 1899: Boer War begins. 1900: Australian Commonwealth proclaimed. 1902: End of the Boer War. 1904: Russo-Japanese War begins. 1905: Russo-Japanese War ends by the Treaty of Portsmouth; Norway separates from Sweden.

1906: First Parliament in Russia. 1907: New Zealand becomes a Dominion. 1909: Union of South Africa formed. 1911: Chinese Revolution; Amundsen reaches South Pole (Dec. 14). 1912: China becomes a Republic under Sun yat Sen; The Titanic disaster.

World Wars. 1914: Archduke Francis Ferdinand of Austria assassinated at Sarajevo (June 28); Serbia suspected of complicity; Austria declares war on Serbia (July 28); The

beginning of the first world war; Germany declares war on Russia (Aug. 1), on France (Aug. 3), and invades Belgium (Aug. 3). England declares war on Germany (Aug. 4). Austria declares war on Russia (Aug. 6). Japan declares war on Germany (Aug. 23). Battle of the Marne between France and Germany (Sept. 6-10); German advance halted. Russia declares war on Turkey (Nov. 2); England and France follow suit (Nov. 5).

1915: Germans start air attacks and submarine blockade against Britain. Germans sink American ship Lusitania (May 7). 1916: Battle of Verdun (Feb. 21-July 11). France stops German advance; Battle of Tannenberg; Russian armies humbled by Germany (Aug. 25); Battle of Jutland; Britain breaks German naval strength (May 31). Battle of Somme. France keeps her line against Germany (July 1-Nov. 18); Lloyd George, Premier, forms war cabinet in Britain; Germans advance on the Eastern front; Vilna falls (Sept. 18). Rasputin, the rascal Russian monk, assassinated by Prince Felix Yussupov (Dec. 30).

Bolshevik Russia. 1917: Russian troops mutiny in Petrograd (March 10). Provisional government formed in Russia. Czar Nicholas II abdicates (March 15), US

declares war on Germany (April 16), Bolshevik Revolution begins in Russia (Nov. 7), Armistice concluded between the revolutionary Government in Russia and Germany (Dec. 5).

1918: Treaty of Brest-Litvosk between Germany and Bolshevik Russia (March 3). British captures Jerusalem (Dec. 8), Czar, Czarina and children executed at Ekaterinburg. Revolution breaks out in Germany; Emperor William II abdicates; German Republic proclaimed (Nov. 9). 1919: Peace conference opens in Paris (Jan. 18); Benito Mussolini founds Italian Fascist Party; Jallianwalla massacre in India (April 13); Treaty of Versailles signed (June 28).

League of Nations. 1920: First meeting of the League of Nations. 1921: Formation of the Irish Free State. 1922: Mussolini marches on Rome and the Fascist Party takes over the Government of Italy. 1923: Turkish Republic proclaimed under Kemal Pasha.

1924: The first Labour Ministry in Britain under MacDonald; Greece becomes a republic; Lenin dies (Jan. 21). 1927: Col. Lindbergh flies across Atlantic. 1928: Capt. Kingsford Smith flies across Pacific. 1929: Wall Street Crash; The beginning of the Great Depression. King Amanullah of Afghanistan abdicates.

Coming of Hitler. 1933: Hitler appointed Chancellor by Hindenburg; German Reichstag set on fire (Feb. 27). 1934: Austrian Chancellor Dollfuss murdered (July 5). Hindenburg dies and Hitler becomes dictator. 1935: Italy starts war against Ethiopia. 1936: Italians occupy Addis Ababa;

Civil War breaks out in Spain; King Edward VIII of England abdicates; Duke of York succeeds King Edward as King George VI.

1938: Munich Agreement between Chamberlain (England), Daladier (France), Hitler (Germany) and Mussolini (Italy). 1939: General Franco establishes dictatorship in Spain (Feb.); Germans invade Poland; Germans and Russians partition Poland; Second World War begins (Sept.). 1940: Germany invades Denmark, Norway, Holland, Belgium and Luxembourg; British evacuation from Dunkirk; Germans occupy Paris; Russians occupy Lithuania, Latvia and Estonia; France surrenders to Germany (June).

1941: Germany attacks Russia (June); Japanese attack on Pearl Harbour (Nov. 7); Japanese occupy Malaya, Philippines and Sarawak.

The Allies Win. 1942: Japanese navy defeated by US fleets off Midway Island (June); Battle of El Alamein (October 23); The Allies rout German forces; The Germans retreat. 1943: Axis Powers – Germany, Italy and Japan – in retreat all over the war zones; Mussolini resigns; Italian Fascist Party is dissolved; Churchill, Roosevelt and Stalin, leaders of the victorious Allies, meet at Teheran.

1944: Allies enter Rome; Allies liberate France, Belgium, Holland and Bulgaria. 1945: Americans invade Okinawa; Japanese Cabinet resigns; President Roosevelt dies (April 12); Mussolini and his mistress shot dead by Italian partisans (April 28); Hitler and his mistress Eva Braun commit suicide (April 30); German forces surrender to Allied armies (May 8).

57. POST WORLD WARS

The signing of the United Nations Charter in 1945 was a landmark in man's quest for peace and world amity. After 40 years of its existence, the world community is now taking stock of its achievements and failures. (For U.N. see chapter on International Organisations.)

The UN Charter was signed at San Francisco on June 26, 1945; Labour Party wins British elections (July 26); Atomic bomb dropped on Hiroshima (Aug. 6); Second atom bomb dropped on Nagasaki (Aug. 9); Japan

surrenders to USA; The end of the Second World War; Trial of major war criminals opens at Nuremberg (Nov. 20)

1946: The first regular session of the UN Assembly held in London (Jan.); Trygve Lie

elected the first Secretary General; Formal winding up of the League of Nations; Meeting of the UN General Assembly in New York (Oct. 23); Nuremberg sentences on Nazis executed; Goering commits suicide.

1947: Indonesia becomes free; India and Pakistan assume Dominion status (Aug. 15); The partition of Palestine approved by the UN; King Michael of Romania abdicates; Romania becomes a Republic.

Gandhiji Dead. 1948: Burma becomes a Republic; Gandhiji assassinated (Jan. 30); Ceylon becomes independent; C. Rajagopalachari succeeds Mountbatten as the Governor General of India; Jews proclaim the new State of Israel in Palestine. 1949: General Mao-Tse-Tung proclaims the People's Republic of China; Chinese Nationalist Government sets up headquarters in Formosa; United State of Indonesia comes into being.

1950: The proclamation of the Republic of India (Jan. 26); The Korean War begins; George Bernard Shaw dies aged 94 (Nov. 2). 1951: Libya becomes independent. 1952: King George VI of Great Britain dies and is succeeded by his daughter Elizabeth II; Olympic Games open at Helsinki (July 1).

1953: Stalin dies aged 74 (March 6); Dag Hammarskjöld elected Secretary General of the UN; Hillary and Tensing conquer Everest (March 29); Korean armistice signed. 1954: Formation of the Federation of Rhodesia and Nyasaland; French settlements in India pass under Indian control. 1955: Marshal Bulganin succeeds Malenkov as Chairman of the Soviet Council of Ministers; Churchill resigns Prime Ministership and is succeeded by Anthony Eden; Afro-Asian Conference at Bandung; Albert Einstein dies (April 18).

Suez Nationalised. 1956: Sudan becomes an independent Republic; Pakistan proclaims itself an Islamic Republic; France leaves Indo-China; Col. Nasser becomes President of Egypt; Nationalisation of Suez Canal by President Nasser; Revolt in Hungary against communist regime; Russia sends troops to Hungary to quell the revolt.

1957: Saar added to the German Federal Republic; Polish Communist Party under Gomulka comes to power in Poland; Ghana becomes independent; Tunisia becomes a Republic; First Earth satellite (Sputnik I)

launched by Russia.

1958: The first American Earth satellite Explorer I launched; Iraq becomes a Republic; French Guinea becomes an independent Republic. 1959: Batista Government in Cuba overthrown by Fidel Castro; Alaska becomes the 49th State of USA; inauguration of the Fifth French Republic under De Gaulle; the Chinese occupy Tibet; Dalai Lama flees to India; Bandaranaike, Prime Minister of Ceylon, assassinated; Archbishop Makarios elected first President of Cyprus.

1960: Cameroon, Togo, Belgian Congo, Ghana, Cyprus, Somalia and Nigeria become independent Republics. Congo (Brazzaville), Chad, Central African Republic and Malagasy become independent. Olympics at Rome (Aug.); Nigeria becomes an independent Republic in the Commonwealth.

1961: Rwanda and Burundi in Africa become Republics; Sierra Leone and S. Cameroon become independent; South Africa becomes a Republic and withdraws from the Commonwealth; Conference of non-aligned nations at Belgrade; Syria secedes from the United Arab Republic; Tanganyika becomes independent within the Commonwealth; India annexes the Portuguese enclaves Goa, Daman and Diu.

Ne Win in Power. 1962: General Ne Win seizes power in Burma; China begins attack on India's northern frontier (Sept. 19); U Thant elected Secretary General of United Nations (Nov. 30); 1963: China and Pakistan sign frontier treaty; Egypt, Syria and Iraq form Arab Federation; Malaya, Singapore and South Borneo form Malaysian Federation; The assassination of President John F. Kennedy in Dallas, Texas (Nov. 22); Zanzibar becomes independent.

1964: Agreement signed between Tanganyika and Zanzibar forming a new State Tanzania; Jawaharlal Nehru, Prime Minister of India, dies (May 27); Malta becomes independent; Soviet Premier Krushchev ousted; Alexei Kosygin becomes Premier and Leonid Brezhnev, Secretary of the Communist Party, Olympiad at Tokyo (Oct.)

1965: Field Marshal Ayub Khan is elected President of Pakistan; Indonesia withdraws from UN (Jan. 5); Sir Winston Churchill dead (Jan. 24); Dr. Albert Schweitzer is dead (Aug. 15); Rhodesia seizes independence

Mobutu takes over in a bloodless coup in the Congo; Soviet President Anastas Mikoyan steps down; Nikolai Podgorny is the new President.

Nkrumah Ousted. 1966: Army takes over the Government of Ghana, deposes President Nkrumah; Sukarno (Indonesia) hands over power to Army Chief Suharto (Mar. 12); Guyana (Guiana) becomes independent; South Africa's Prime Minister Dr. Verwoerd assassinated.

1967: India signs International Space Treaty in Moscow; Gen. Suharto becomes President of Indonesia; Konrad Adenauer, former West German Chancellor, dies; Nassar blocks gulf of Aquaba, Israel's vital sea outlet; Eastern Nigeria secedes to become Biafra Republic. Israel strikes a pre-dawn blow on UAR, Syria and Jordan and captures Gaza, Sinai and Jerusalem. Fighting ends in Suez Canal area with acceptance of cease-fire; Russia celebrates the 50th anniversary of the Bolshevik Revolution.

1968: South Pacific Island of Nauru and Mauritius become independent. Martin Luther King assassinated (Mar. 5); Soviet Union and Warsaw Pact countries forces invade Czechoslovakia; Swaziland becomes independent; the 19th Olympic Games open in Mexico City (Oct. 9); Equatorial Guinea becomes independent.

Man Lands on Moon. 1969: Mrs. Golda Meir becomes Prime Minister of Israel; President Ayub Khan hands over power to the Army Commander Gen. Yahya Khan; Dwight D. Eisenhower (78), former US President and Supreme Commander in World War II, dies (Mar. 28); U.S. astronauts Neil Armstrong and Edwin Aldrin set foot on the Moon (July 21). President Dr. Ho Chi Minh (79), the Father of North Vietnam, passes away (Sept. 4).

1970: The 30-month-fighting for a separate Biafra collapses. Bertrand Russell (97) passes away (Feb. 3); Former Portuguese dictator Antonio Salazar (81) passes away (July 27); President Gamal Abdel Nasser (52) dies (Sept. 29); Charles de Gaulle (79), former President of France, dies (Nov. 10); Defence Minister Hafez Assad seizes power in Syria (Nov. 14); Soviet Lunokhod 1 lands on Moon. (Nov. 17); Awami League led by Sheik

Mujibur Rahman gets absolute majority in Pakistan's first general election.

Bangladesh Born. 1971: Inauguration of the Aswan Dam in Egypt (Jan. 15); Gen. Idi Amin ousts President Milton Obote in Uganda (25); Apollo 14 astronauts Shepard and Mitchell land on the Moon (Feb. 2); Mujibur Rahman declares Bangladesh independent (Mar. 26); Mujibur Rahman arrested by the Pakistan army; Russia sends up Salyut I; Soyuz X links with Salyut in space (April 19); Apollo 15 launched (Aug. 8); Nikita Krushchev dies (Sept. 11); China admitted to the UN; Taiwan expelled (Oct. 25); Union of Arab Emirates formed (Dec. 2); Pakistan attacks India from the west (3); India recognises Bangladesh; Pakistan army in Bangladesh surrenders (16); Indo-Pakistan war ends (17); Yahya Khan resigns Pakistan Presidentship, Bhutto becomes President (20); Dr. Kurt Waldheim appointed UN Secretary General.

1972: Bhutto releases Mujibur Rahman (Jan. 8); Pakistan leaves Commonwealth (Apr. 21); President Nixon visits Moscow (May 22); Fourth Conference of non-aligned nations meets in Georgetown, Guyana (Aug. 8); Twentieth Olympics open at Munich (26); Bloodbath in Olympic village; Arab guerillas kidnap and kill Israeli sportsmen; Nixon elected President for a second term (Nov. 8).

1973: Britain joins E.C.M. (Jan. 1); Awami League led by Mujibur Rahman wins first election in Bangladesh (Mar. 2); Pablo Picasso dies (April 8); Bahamas becomes independent (July 10); Afghanistan ends monarchy and becomes a Republic (18); W. Germany, East Germany and Bahamas become U.N. members (19); War breaks out in West Asia between Israel and Egypt and Syria (Oct. 6); Ceasefire in West Asia (22); David Ben Gurion, first Prime Minister of Israel, dies (Dec. 1).

Nixon Resigns. 1974: Mohommadulla elected President of Bangladesh (Jan. 24); Libya nationalises American oil companies (Feb. 11); Pakistan recognises Bangladesh (22); Emperor Haile Selassie deposed (27); Jigme Singye Wangchuk crowned King of Bhutan (June 2); Cyprus army overthrows President Makarios (July 15); Nixon resigns presidency; Gerald Ford takes over as the 38th President of USA (Aug. 9); UN admits

Bangladesh, Guinea-Bissau and Grenada as members; Labour wins British elections with a narrow majority (Oct. 11). U. Thant, former UN Secretary General, dies in Burma (25); Malta becomes a republic (Dec. 15).

1975: Mujib assumes full powers as President; One-party rule in Bangladesh (Jan. 25); Margaret Thatcher elected first woman leader of the British Conservative Party (Feb. 11); P. G. Wodehouse dead; Julian Huxley dead (14); Birendra crowned King of Nepal (Mar. 6); King Faisal of Saudi Arabia assassinated (25); Taiwan's President Chiang Kaishek dead (April 5); Saigon surrenders to communists (30); Mrs. Junko Tabei (36) of Japan becomes the first woman mountaineer to scale Mt. Everest (May 17); Eisaku Sato, former Prime Minister of Japan and Nobel Peace Laureate, dead (June 2); Suez Canal reopens after eight years (5).

Mozambique becomes free after nearly 500 years' Portuguese rule (July 6); Sao Tome and Principe Islands off the west coast of Africa achieve independence from Portugal (12); Soviet 'Soyuz' and American 'Apollo' space ships link up in space (17); Army coup in Bangladesh; Mujibur Rahman killed; New regime under Khondokar Mushtaq Ahmed (Aug. 15); Israel signs agreement with Egypt (Sept. 1); Papua (New Guinea) becomes free (15); Special UN session adopts plan for new world economic order (16); The Nobel Peace Prize goes to father of Soviet hydrogen bomb, Dr. Sakharov (Oct. 9); 'Venus'-9 soft-lands on planet Venus while module becomes satellite; Arnold Toynbee dead (22); Angola becomes free from Portuguese rule; Spanish dictator Franco dead (Nov. 20); Juan Carlos becomes King of Spain (22); Laos becomes a Republic (Dec. 3).

Indo-Soviet Treaty. 1976: Premier Chou En-lai of China dies (Jan. 8); Paul Robeson dies (23); British PM Harold Wilson announces resignation (Feb. 16); Military chiefs take over in Argentina, arrest Mrs. Peron and dissolve Parliament (24); James Callaghan is new British PM. Hua Kuo-feng made Chinese Premier (April 7); Mrs. Gandhi and Brezhnev sign Moscow declaration to further friendship, co-operation (June 11); Vietnam is unified (24); Seychelles becomes independent (29); Airborne Israeli Commandos destroy Ugandan planes, kill 100 Ugan-

dans and free Air France Air-bus passengers from hijackers at Entebbe, Uganda (July 4); Over 9000 dead in Iran earthquake of June 26 and 28 (8); Exodus by 16 African nations as Montreal Olympics open reduces the games to a virtual "White affair" (17).

US Probe lands on Mars (20); Soares heads first democratic Government in Portugal (23); Non-aligned summit opens at Colombo (Aug. 16); Second World Hindi Conference in Mauritius; Khan Abdul Ghaffar Khan is released in Pakistan (28); Mao Tse-tung dies (Sept. 9); Hua Kuo-feng succeeds Mao (9); Mao's widow Mrs. Chiang Ching and three top radicals arrested (12); India elected to UN Security Council (23); In East Turkey 3000 die in earthquake (24); Sir Sewoosagar Ramgoolam forms Coalition Government in Mauritius (Dec. 23); Takeo Fukuda succeeds Miki as Japanese PM (24).

Carter President. 1977: Jimmy Carter sworn in President of the United States (Jan. 20); Mohammed Daud sworn in President of the Republic of Afghanistan (Feb. 17); Bhutto's People's Party wins landslide victory in Pak Polls (March 8); Maj. Gen. Ziaur Rahman sworn in new Bangladesh President (April 21); Ludwig Erhard, former West German Chancellor dead (May 6); Leonid Brezhnev elected Soviet President (June 16); Djibouti becomes independent (27).

Coup in Pakistan; General Zia-ul-Haque takes over. Bhutto deposed and arrested (July 5); Ruling (Sinnama's) Party routed in Sri Lanka Poll - Jayawardene become Premier (22); Bhutto released. Cyprus President Archbishop Makarios dies (Aug. 3); Ian Smith wins election in Rhodesia (Sept. 1); Bhutto arrested again in murder case (3); North Yemen President and brother assassinated (Oct. 12); Lufthansa plane hijacked; West German anti-guerilla squad kills three hijackers and frees hostages in historic action in Mogadishu on October 18 (13); US withdraws from ILO (Nov. 2); President Sadat of Egypt makes historic visit to Israel (19); Arab front against Egypt formed (Dec. 4); Charlie Chaplin dead (25).

1978: Jayawardene sworn in as First President of Sri Lanka (Feb. 4); Two Russian cosmonauts set up record with 84 days in space (Mar. 4); Bhutto appeals against death sentence (25); Military junta seizes power in

Afghanistan (Apr. 27); Zia-ur-Rahman wins Bangladesh Presidential election (June 4); Argentina wins World Cup Football beating Holland, 3-1 (25); Coup in South Yemen (26); Army officers seize power in Mauritania (July 10).

First test-tube baby born in Oldham, U.K. (25); Commonwealth Games at Edmonton, Canada (Aug. 3); President Jomo Kenyatta of Kenya dies (22); Zia-ul-Haque sworn in as President of Pakistan (Sept. 16); Peter William Botha elected South African P.M. (26); Daniel Arap Moi elected President of Kenya (Oct. 6); 900 bodies of victims of suicide by a religious sect found in Guyana (Nov. 20); Golda Meir dies (Dec. 8); Asian Games begin in Bangkok (9).

Year of the Child. 1979: International Year of the Child opens (Jan. 1); Shah leaves Iran (16); Ayatollah Khomeini returns to Iran after 14 years of exile (Feb. 1); Iran proclaimed Islamic Republic (Apr. 1); Bhutto executed (4); Idi Amin overthrown in Uganda (11); Greenland gets home rule (May 1); Margaret Thatcher becomes the first woman Prime Minister of Britain (4); 'Bhaskara' launched from Soviet Union (June 1); Salt II agreement signed by Carter and Brezhnev in Vienna (18); Skylab plunges down off the western Australian coast (July 11); Mountbatten killed in an explosion off Ireland (Aug. 27); Sixth Non-Aligned Conference opens in Havana (Sept. 3); Emperor Bokassa of the Central African Empire overthrown in coup (21); Army seizes power in Bolivia (Nov. 1); Iranian students occupy US Embassy in Teheran and holds the residents as hostages (4); Muslim extremists seize Kaaba Mosque in Mecca (21); Hafizulla Amin of Afghanistan killed in a coup (Dec. 27).

1980: U.S. halts grain shipments to Russia in retaliation to the latter's occupation of Afghanistan (Jan. 5); Trudeau returns to power in Canada (Feb. 19); Army seizes power in Surinam (25); Jesse Owens, American Olympic Champion, dies (Mar. 31); Jean Paul-Sartre, French philosopher and writer, dies (April 16); Free Zimbabwe born (17); U.S. attempt to free hostages in Iran fails (22); Marshal Tito of Yugoslavia dies (May 4); China admitted to the World Bank (16); China successfully tests long-range rocket (ICBM) (18); Japanese P.M. Ohira dies; Suzuki new P.M. (June 12).

Moscow olympics begin (July 19); Polish workers wrest right to strike (Aug. 30); Regional meeting of Commonwealth Heads of Government (CHOGRAM 2) opens in Delhi (Sep. 4); Hua resigns Premiership of China; Zhao Ziyang takes over (6); Libya and Syria announce merger (10); Quake in Algeria kills 20,000 (Oct. 10); Emergency proclaimed in Sri Lanka (14); Mrs. Bandaranaike stripped of civic rights (16); Kosygin resigns as Soviet Premier (23); Ronald Reagan elected U.S. President in a landslide victory over Jimmy Carter (Nov. 5); Trial of 'Gang of Four' begins in Beijing (20); Coup in Upper Volta (25); Kosygin, former Soviet Premier, dies (Dec. 19).

Reagan in Power. 1981: International year of disabled persons begins (Jan. 1); Banking Islamised in Pakistan (2); Left-wing guerillas in El Salvador form Govt. in exile (13); US resumes military assistance to junta in El Salvador (15); Fifty-two American hostages fly out of Teheran after 444 days of captivity; Ronald Reagan takes charge as the 40th President of the United States (22); China's special court sentences Mao's widow Jiang Qing to death for treason, but reduces sentence to two years of solitary confinement and hard labour (25); Ancient flag of the Jaffna Tamil Kings unfurled in Jaffna after 400 years; Roy Panther, amateur astronomer, discovers Panther's comet; Polish P.M. Jozef Pinskiwski resigns; Gen. Jaruzelski succeeds (Feb. 10).

Mujibur Rahman's daughter, Begum Hasina elected President of the Bangladesh Awami League (18); Former Argentine President, Mrs. Maria Estela Peron sentenced to eight years in prison (March 20); All political parties in Pakistan dissolved (24); Reagan shot at, but survives assassin's bullet (31); "Ordinary People" directed by Robert Redford wins Oscar award for the best film (April 1). U.S. Space Shuttle, Columbia, with two astronauts blasts off from Cape Canaveral (12).

Pope Shot at. U.S. lifts grain embargo against USSR (Apr. 24); U.S. decides to back Kampuchean rebel forces; (May 3); IRA hunger striker Bobby Sands dies for the cause of prison reforms; President Heng Samrin and his colleagues returned by majority (5); Socialist Party Chief Francois

Mitterrand wins French Presidential election (10); Pope John Paul shot at in Vatican City (13); Pierre Mauroy named French Prime Minister (21); Zia-Ur-Rahman, President of Bangladesh and eight aides assassinated; Emergency proclaimed (30).

Sri Lanka proclaims state of emergency (June 4); House of Commons passes Britain's controversial new Nationality Bill (5); World's first twins conceived in a test-tube, a boy and a girl, are born to a 31-year-old woman in Melbourne's Queen Victoria hospital (6); Surya Bahadur Thapa takes over as Nepal Prime Minister (16); Sixty-nine of Iran's political leaders, including the Chief Justice, Ayatollah Mohammed Beheshti killed in bomb blast in Teheran; Chinese Communist Party Chairman Hua Guofeng is replaced by Hu Yabobang (28).

Mrs. Sandra Day O. Connor appointed the first woman judge of the U.S. Supreme Court (July 7); Mohammed Ali Rajai elected President of Iran to succeed Bani-Sadr (25); Paris gives asylum to Bani-Sadr; Prince Charles, heir apparent to the British throne, weds Lady Diana (29); Bani Sadr, deposed Iran President forms Govt.-in-Exile (August 3); Iran's President Mohammad Ali Rajai and Prime Minister Mohammad Banohar killed in bomb blast in the Prime Minister's office (30); Madhvi Kani named new Prime Minister of Iran; Belize becomes independent (Sept. 2); TGV, the world's fastest train at 270 Km per hour makes inaugural trip from Paris to Lyons (22); Army officers hanged in Bangladesh in connection with the assassination of President Zia-ur-Rahman in May (12).

Sadat Killed. Egyptian President Anwar Sadat assassinated by a group of soldiers during military parade in Cairo (Oct. 6); Hosni Mubarak sworn in Egypt's fourth President (14); Polish Communist Party leader Stanislaw Kania sacked (18); Socialist forces swept back to power in Greece (19); Cancun summit of 22 Government leaders ends on note of uncertainty and lack of agreement (24).

Antigua and Barbuda become independent (Nov. 1); U San Yu, retired Army General, succeeds U Ne Win as President of Burma (9); Javier Perez de Cueller, 61-year-old former Chief delegate of Peru, elected U.N. Secretary-General to succeed Dr. Kurt

Waldheim (Dec. 12); Army takes over in Poland; emergency proclaimed and Solidarity leaders put in jail (13); Israel enacts new law to annex Golan Heights, occupied Syrian territory (14); U.S. President Reagan orders sanctions against Poland (24); Ft. Lt. Jerry Rawlings returns to power in Ghana over-throwing Dr. Limann in military coup (31).

Sinai Withdrawal. 1982: Egypt and Israel agree on final withdrawal of Israeli forces from Sinai (January 9); Soviet Communist Party Secretary Michael Suslov dies (25); Mauno Koivisto elected President of Finland (26); U.S. allows passage to Khalistan protagonist Jagjit Singh in spite of India's opposition (Feb. 9); India agrees to give long-term aid to Vietnam (13); Sri Lanka shifts capital to Jayawardenapura (15); Pakistan Foreign Minister Agha Shahi resigns due to ill-health (16); Zimbabwe Prime Minister Robert Mugabe sacks Joshua Nkomo, veteran nationalist from cabinet (17). South-South Conference inaugurated in New Delhi—44 nations take part; Julius Nyerere, Tanzanian President, presented the 1981 Third World Prize in New Delhi (22).

Soviet spacecraft Venus-13 lands on Venus (March 1); Charles Haughey becomes Irish Prime Minister (9); A rare tryst of nine planets in the same quadrant observed (10); National Liberation Council seizes power in Surinam (11); Army takes over government in Bogota (13); Britain and the Vatican resume full diplomatic relations after four centuries (19); Switzerland decides to join United Nations (23); Lt Gen. H. M. Ershad seizes power in Bangladesh; Coup in Guatemala; Junta led by Gen. Efraim Rios Mont (24); A. F. M. A. Choudhary sworn in as Bangladesh President (27); Polling in El Salvador amidst fighting (28).

Argentina occupies Falkland Isles, a British colony in South Atlantic (April 2); British fleet leaves for Falklands (6); 10,000 feared dead in the eruption of the Chichonal volcano in Mexico (7); India signs deal for the purchase of 40 Mirage-2000s with France; Art Buchwald and John Updike win Pulitzer awards (15).

A new constitution for Canada comes into force (April 17); Dr. Mahathir Mohammed scores big win in Malaysian elections (23); Egypt officially gets back Sinai peninsula, 15

years after Israeli occupation (25); Britain recaptures South Georgia island off Falklands; Argentine Commander surrenders (26); Sea Law convention adopted (30).

Falkland War. Britain and Argentina accept UN proposals to end hostilities (May 6); U.K. Forces attack Falklands capital; Luis Alberto Monge becomes Costa Rican President (9). A manned Soviet spacecraft docks with orbiting Salyut-7 (15). U.K. troops land on Falklands (21). Iran announces recapture of Iraqi-occupied city of Khorramshahr after 20 months of Gulf war (24). Yasser Arafat, leader of the P.L.O. leaves Beirut (30). King Khalid of Saudi Arabia dies (June 13). Argentina surrenders to Britain in the Falklands (15). U.S. Secretary of State Alexander Haig resigns; Lebanese Prime Minister Shafiq-al-Wazzan resigns (25). Alitalia Airlines plane flying between Rome and Tokyo hijacked by Sri Lankan national, Sepala Ekanayake; PLO agrees to leave Beirut (30).

Dominican President A. Guzman dies (July 4). Miguel De La Madrid elected President of Mexico (5). Former Nepalese Prime Minister B. P. Koirala dies (21). Dr. Richard H. Lawler (86), Nobel Prize nominee, who performed the world's first kidney transplant dies (24). Italian Prime Minister, Giovanni Spadolini resigns (Aug. 7). U.N. World Assembly on Ageing unanimously adopts 48-point plan of action (9). Soviet Union launches into space a woman cosmonaut for a rendezvous with the orbiting space station Salyut 7 (18). P.L.O. pull out from Beirut begins (21). 40-year-old unmarried psychologist, Dr. Afton Blake, gives birth to the second baby to the produced with the help of 'Nobel' sperm bank (25). Ingrid Bergman (67) Swedish-born film actress dies (29).

Polish communist leader W. Gomulka dies (Sept. 1). Successful trial run in Japan of a new extra fast remote-controlled train which floats above the line on a magnetic field (2). World's highest submarine mountain discovered in the Samoan Archipelago by Soviet research ship 'Callisto' (12). Lebanon's President-elect Bashir Gemayel (34) is assassinated in a bomb explosion (15). Mass massacre in two Palestinian refugee camps, Chatilla and Sabra, in W. Beirut (18).

Solidarity banned. Conservative Opposition leader Helmut Kohl is elected

Chancellor of W. Germany ousting Helmut Schmidt midterm through a parliamentary vote (Oct. 1). Poland's independent trade union Solidarity is dissolved by an Act of Sejm, the Parliament; Lord Noel Baker (92), Nobel Peace Prize winner and former Labour Party Cabinet Minister, dies in London (8). Dr. Anna Freud (86), a psychoanalyst and daughter of pioneer psychoanalyst Sigmund Freud, dies; U.S. experiences the worst phase of unemployment (10.1 per cent or 11,260,000 people out of work) in 42 years (9). Japanese Premier Zenko Suzuki resigns (12). Halley's comet sighted at Mt. Palomar near San Diego for the first time since it last zipped by the Earth in 1910; Iranian Supreme Court, last vestige of the former Shah's rule, abolished (16). Pierre Mendes-France (75) former French Premier and World War II resistance leader, dies (18).

Soviet President Leonid Brezhnev (75) dies in Moscow (Nov. 10). Lech Walesa, leader of outlawed Poland's Solidarity free trade union, is released after 11 months of internment; Yuri Andropov succeeds Brezhnev as General Secretary of the Soviet Communist Party; Astronauts of U.S. Space Shuttle Columbia release Canadian satellite fulfilling the first commercial contract to launch satellites (12). Seventyfive Israelis including the Prime Minister Menachem Begin's wife die in a building blast in Lebanon (14). Wu Xuequan replaces Huang Hua as Chinese Foreign Minister (19). Yasuhiro Nakasone is elected Japan's Prime Minister (26). Row in the U.N. over who discovered America puts off decision on whether to celebrate 500th anniversary of the arrival of Christopher Columbus in the new world; World Premiere of Sir Richard Attenborough's 'Gandhi' in New Delhi (30).

Miguel De La Madrid is sworn in President of Mexico. Amintore Fanfani, Christian Democrat, forms Italy's 43rd post-war Government (Dec. 1). Spain's first socialist majority parliament elects Felipe Gonzalez Prime Minister; Sixty-one-year-old Barney Clark, given an artificial heart (2). China adopts new constitution that replaces Maoist principles (4). China issues two stamps to mark 40th anniversary of the death of Dr. Dwarakanath Kotnis; Helicopter-borne South African troops raid Maseru, Lesotho's capital and kill

30 members of banned African National Congress (9). Soviet cosmonauts, Anatoly Berezevoi and Valentin Lebedev return to earth after 211 days in space, a new endurance record (10). Thousands of women from 15-Km human chain around U.S. Air Force base in Berkshire, U.K. in an anti-nuclear protest (12). The big green gate between the British colony of Gibraltar and Spain is reopened after 13 years (14).

New Delhi Summit. 1983: Former Soviet Head of State, Nikolai Podgorny (79) dies (Jan.12). More than a quarter million Ghanians leave Nigeria to return to homeland (31). Ariel Sharon resigns as Defence Minister of Israel (Feb. 11). Spyros Kyprianou re-elected President of Cyprus (14). OPEC forced to cut prices as Nigeria cuts oil price (21). Playwright Tennessee Williams (71) dies (25). Arthur Koestler (77), author of *Darkness at Noon*, dies (March 3). Bob Hawke, Labour Party leader is Australia's Prime Minister (5). Seventh Non-aligned summit opens at New Delhi, Indira Gandhi appeals for reversal of arms race (7). Prime Minister Indira Gandhi and Minister in charge of Family Planning in China, Qian Xiwzhong, win first UN Population Award (19). Barney Clark, world's first and only recipient of a permanent artificial heart, dies (23).

Border between Morocco and Algeria re-opened after a seven-year closure (April 5). Vietnam starts partial withdrawal of forces from Kampuchea (May 2). Newly discovered comet streaks to within five million Km of the Earth, closer than any other comet in more than 200 years (11). Soviet Union develops very advanced fighter in MIG series, a match to U.S. built F-16 (19). King Idris (93), former Monarch of Libya, dies (25). Gerd Heide-mann, the reporter who bought the forged Hitler diaries for *stern* magazine, arrested (27).

Prime Minister Indira Gandhi addresses UNCTAD in Belgrade: (June 8). Three South African freedom fighters hanged in Pretoria (9). British Prime Minister Margaret Thatcher, leading the right wing Tories; returned to power for another five-year term (10). Pioneer 10 explorer leaves Earth's solar system to begin its endless voyage among the stars (13). Li Xiannian (78) elected, Head of State by sixth National People's Congress

(China's Parliament) (19).

Sheila Cameron, first woman Vicar General in Church of England (July 7). Lokendra Bahadur Chand (44) appointed Nepal's Prime Minister (12). Sri Lanka government announces death of 35 suspected Tamil terrorists and prisoners in a clash at Welikada jail (26). About 20,000 persons, displaced and rendered homeless following riots in Colombo (27). David Niven (73), British movie actor, dies (29). Sudanese President Jaafar Nimeri frees all 13,000 inmates in Sudan's jails (30).

Acquino Murdered. Members of Sri Lanka's main minority party, the Tamil United Liberation Front (TULF), declares boycott of parliament following new legislation on oath against separation (August 7). President Shehu Shagari wins second term in office in Nigeria (11). Philippines opposition leader Benigno S. Aquino Jr. returns from voluntary exile, shot and killed when he touches home ground (21). Prime Minister Aneerood Jugnauth's three, party alliance wins massive victory in Mauritius', second elections (22). Space Shuttle Challenger takes off from Cape Kennedy with Indian satellite INSAT-1B aboard for deployment in space (30). South Korean Boeing 747, with 269 persons aboard, shot down by Soviets into Japan Sea; Daughter of Vatican official kidnapped two months earlier executed (Sep.1). Israeli Foreign Minister, Yitzhak Shaniv, chosen to succeed resigning Premier Minister Menachem Begin (2). John Vorster (67) former South African Prime Minister, dies in Cape Town (11). Rangan (60), filmstar, dies in New Jersey, U.S. (12). Caribbean Islands of St. Kitts and Nevis become the world's newest nation, after gaining independence from Britain (19).

Walesa: Nobel Prize. Julius Nyerere, Tanzanian President, awarded the Nansen Medal, the highest honour of the UN High Commissioner for Refugees. Lech Walesa, leader of the outlawed Solidarity Free Trade Union in Poland, awarded the 1983 Nobel Peace Prize (Oct. 3). William Golding, British novelist, wins 1983 Nobel prize for literature (7). The former Japanese Prime Minister, Kakuei Tanaka found guilty of taking a 500-million-Yen (Rs. 22 crores) bribe from the Lockheed Aircraft Corporation and sentenced to four years in prison and a fine

equivalent to the bribe. Prof. Subramanyam Chandrasekhar, India-born American, shares 1983 Nobel Prize for Physics with fellow American Prof. William Fowler (19). Maurice Bishop, Prime Minister of Grenada, shot dead and a round-the-clock curfew imposed (20). United States and a coalition of small Caribbean countries invade Grenada to eject the military junta in power there (25).

Raul Alfonsin of the Radical Civic Union Party elected President of Argentina. The Philippines President, Ferdinand Marcos, names the Prime Minister Cesar Virata his successor (31). The Turkish-controlled area of Cyprus declares unilateral independence (Nov. 15). Queen Elizabeth II, accompanied by husband, Duke of Edinburgh, arrives in Delhi on 9-day visit (17). Week-long Commonwealth summit opens in Delhi (23). The Queen invests Order of Merit on Mother Teresa (24).

Gen. Hussain Ershad proclaims himself President of Bangladesh (December 11). The ruling Liberal Democratic Party in Japan fails to win majority in Parliament, but forms Government with help of independents; former Prime Minister Tanaka, convicted on a bribery charge, re-elected from his constituency (19). Yasser Arafat and his supporters sail out of Lebanon, as a result of attacks by the rebel faction of the Palestine Liberation Organisation (20). U.S. notifies withdrawal from UNESCO (28).

ASAT Tested. 1984: Rev. Jesse Jackson, civil rights activist and aspirant for Democratic Presidential nomination, secures release of Lieut. Robert O. Goodman, American bombardier whose plane was brought down by Syria in Lebanon (Jan. 3); Souvanna Phouma, (83) Laotian prince and former Prime Minister, dies (10); U.S. Supreme Court rules that the use of video records at home to tape television programmes and movies does not constitute an offence under the federal copyrights law (18); U.S. conducts its first test of a missile with the potential to destroy satellites (ASAT) in outer space, Johny Weissmuller (79), five-time Olympic swimming champion, dies (22); Sohrab Modi, veteran film actor, director, producer (86) dies (28);

Kashmir Liberation Army kidnaps Indian Asst. High Commissioner in Birmingham, R. Mhatre and later kills him (Feb 4), "Alice in

Wonderland" in reality is Queen Victoria's autobiography, concludes a group of researchers after 11 years of study (5); Astronauts Bruce McCandless and Robert Stewart walk in space 280 km above the Earth to test "Buck Rogers" backpacks in the first free flights through space (7); U.S. withdraws 1,600 marines from Lebanon (8); Soviet President Yuri Andropov dies (10); Konstantin Chernenko becomes new Soviet Communist Party Chief (13); Mikhail Sholokov, (78), Nobel Prize-winning author of "And Quiet Flows the Don", dies (21).

Feat of Rakesh. Canadian Prime Minister Pierre Trudeau announces intention to resign (1 March). Mother Teresa University, Kodaikanal, first Women's University in Tamilnadu, inaugurated by Mother herself (2). Mauritius Prime Minister Aneerood Jugnauth inaugurates the first international conference on Sanskrit at Mahatma Gandhi Institute in Port Louis (15). Squadron leader Rakesh Sharma becomes India's first space-man when he was launched aboard Soyuz T-11 from Baikonur Cosmodrome in Kazakhstan along with two Russians (April 3). Col. Lansana Konte appointed President of Guinea and Col. Diara Traore, the Prime Minister (5). Kerala Government decides to drop Silent Valley Project and declare the entire area a National Park (13). Astronauts on board Space shuttle Challenger successfully retrieves disabled satellite Solar Max, repairs it and deploys it again completing world's first in-orbit retrieval and repair (12). Lebanese President Amin Gemayal returns to Beirut with Syria's backing to form a new government (20). Former Yugoslavia President Milovah Djilas released (21). U.S. and China agree on nuclear co-operation (24). Sultan Iskander of Johore sworn in as eighth king of Malaysia (26).

Phu Dorjei conquers Mount Everest without oxygen- a rare feat (May 9). Miss Bachendri Pal becomes first Indian woman to conquer Mount Everest; Dr. Richard von Weizsaeck, former Mayor of West Berlin, elected sixth President of W. Germany (23). Over 400 massacred by tribal insurgents at Chittagong Hill Tracts in Bangladesh (June 1). Indian Army takes control in Punjab to stem terrorist violence (2). Army storms the Golden Temple and other religious places to flush out terrorists; over 325 including Jarnail

Singh Bhindranwale killed (6). Enrico Berlinguer (62), Italian Communist Party leader, dies (11). Vietnam withdraws about 10,000 of its troops stationed in Kampuchea (15). John Turner sworn in as Canada's Prime Minister (30).

Change in Kashmir. Farooq Abdullah's Ministry dismissed in Srinagar and G.M. Shah sworn in as Chief Minister (July 2). Union Ministry reshuffled; Narasimha Rao appointed Home Minister (19). Golden Temple at Amritsar re-opened to pilgrims (27). Prime Minister Lange's Labour Party sweeps to landslide victory over Robert Muldoon's ruling National Party in New Zealand (14). Laurent Fabius appointed new PM in France (17). Bomb explosion at Meenambakkam Airport kills 32 (August 2). Leon Cordere sworn in as Ecuador's 38th President (12). N.T. Rama Rao's ministry dismissed by Governor Ram Lal and Bhaskara Rao sworn in as Chief Minister in Andhra Pradesh (16). R. Venkaetaraman elected 8th Vice-president of India (22). Tamil Nadu Food Minister S.D. Soma Sundaram, dismissed from the state cabinet (Sep.3). Bhaskara Rao resigns as chief minister of A.P. on governor's demand, and N.T. Rama Rao back in power (16). Brian Mulroney wins general election in Canada; Prime Minister P.W. Botha elected President of S.Africa (5). North and South Koreans open borders for the first time since 1945(30).

Indira a Martyr. Unilateral ceasefire by Mizo rebels ordered by Laldenga (Octo-

ber 2). T.N. Chief Minister M.G. Ramachandran suffers a stroke (14). Indira Gandhi assassinated by 2 of her own security guards at her residence in New Delhi; Rajiv Gandhi sworn in as PM (31). Violence takes a toll of about one thousand in New Delhi following the assassination of Indira Gandhi; M.G.R. flown to New York in a special plane (Nov.3). Regan re-elected US President with a record margin (7). Rajiv Gandhi elected Congress (I) President (12). Tamil Nadu Assembly dissolved (15). Andhra Pradesh Assembly dissolved; Rama Rao seeks fresh mandate (22). Y.B. Chavan (71), former Dy. P.M. dies (25). Ex-M.P. M.N. Govindan Nair (74) dies (27).

Bob Hawke wins general election in Australia (Dec.1) 2,500 persons killed due to inhalation of poisonous gas from Union Carbide plant at Bhopal; Dr. Narasimha God Bole (97), founding -father of Technical Education dies (5). Asok Mehta, former Union Minister, dies (11). China and Britain sign agreement to transfer Hong Kong to China in 1997 (19). Gen. Zia-Ul-Haq seeks fresh mandate for five years as President (20). Polling for 8 Lok Sabha and Tamil Nadu Assembly (24). Indian Supertanker 'Kanchenjunga' carrying 20,00,000 tonnes of oil hit in the Gulf by missile (25). Ramakrishna Hegde, Karnataka Chief Minister, resigns and recommends dissolution of the Assembly, following the Lok Sabha poll verdict; AIADMK sweeps back to power in Tamil Nadu (29).

58. WONDERS OF THE WORLD

Man is the proud inheritor of many wonders, notably the *Seven Wonders of the ancient world*. Though the modern wonders brought about by the advancement of science and technology have overshadowed them, the ancient wonders stand out with their timeless charm.

The practice of listing the wonders of the world started with Antiper of Sidon, a Greek of the second century A.D., according to some scholars. Others attribute it to a Byzantine mathematician and traveller, Pilon in 150 B.C. Whoever started it, the list consisted of seven man-made structures.

The seven wonders of the ancient world were: 1. The Pyramids of Egypt. 2. The

Hanging Gardens of Babylon. 3. The Temple of Artemis (Diana) at Ephesus. 4. The Tomb of Mausolus at Halicarnassus. 5. The Colossus at Rhodes. 6. The Statue of Zeus (Jupiter) at Olympia. 7. The Pharos (Lighthouse) at Alexandria.

Of the seven wonders enumerated by Antiper, only one—the Pyramids of Egypt—survives to this day more or less intact.

Fragments of two other wonders—the Temple of Artemis at Ephesus and the Mausoleum at Halicarnassus—are traceable. The others have disappeared without a trace.

1. The Pyramids of Egypt. These royal tombs which housed the dead Pharaohs of Egypt are about 70 in number and lie on the west side of the Nile beginning at Gizeh (Giza) opposite Cairo and extend south for some 60 miles or so. They represent 1200 years of Egyptian history.

The pyramids mentioned by Antiper are three, all built by the Pharaohs of the Fourth Dynasty. These are the great pyramids at Gizeh consisting of 1. the Pyramids of Cheops (Kufu), 2. the Pyramid of Khefru (Chefren) and 3. the Pyramid of Menakaure (Mycerinus). The biggest pyramid is the Cheops pyramid now about 147 metres in height. It is built of some 2,300,000 blocks of stone each weighing about 2½ tons and put together with surface joints so perfectly cut as to rival the accuracy of modern commercial optics. The Pyramid of Khefru is 143 metres high and that of Menakaure around 67 metres.

2. The Hanging Gardens of Babylon were near the Euphrates River, in the palace of King Nebuchadnezzar, 60 miles south of the present city of Baghdad, and not far from the eastern border of the Syrian Desert of Northern Arabia. The terraced gardens, planted with flowers and small trees, with fountains and refectories interspersed, were 75 to 300 feet above the ground. Water was stored in a reservoir on the top terrace and was piped down to the gardens. They date from about 600 B.C.

3. The Temple of Artemis (Diana), in Asia Minor at Ephesus, an ancient but now vanished city, was south of Smyrna. It was built in the fifth century B.C. by the Ionian cities, as a joint monument from plans drawn by the architect Ctesiphon. The building was of marble, 425×225 feet and the roof was supported by 127 columns of Parian marble each 60 feet high and each weighing about 150 tons. In 356 B.C. the temple was burned by Herostatus, a crank.

4. The Tomb of Mausolus, King of Caria, in Asia Minor was at Halicarnassus, on the eastern side of the Aegean Sea. It was built of marble about 352 B.C. by Queen Artemisia,

the widow, and was remarkable for its beauty and its magnificent interior. It was destroyed by an earthquake.

5. The Colossus at Rhodes was a bronze statue of the Greek Sun-god *Helios*, 70 cubits (about 109 feet) high, erected by Charles of Lindus at the port of the City of Rhodes on the island of Rhodes in the eastern part of the Mediterranean Sea. It was completed about 280 B.C. but was thrown down in an earthquake in 224 B.C. There it lay on the ground until 672 A.D. when the Turkish Government having seized Rhodes, sold the statue and it was broken up.

6. The Statue of Zeus (Jupiter) was in the valley of Olympia, province of Elis, 12 miles or so inland from the west coast of the southern peninsula of Greece, which was then called the Peloponnesus.

The statue begun by the Greek sculptor Phidias after he had been banished from Athens in 432 B.C. was of marble encrusted with ivory and the draperies were of beaten gold. The bearded god was in a sitting posture, with an olive wreath on his head. In his right hand was the figure of victory, in the left, a sceptre.

7. The Pharos of Alexandria, a white marble lighthouse or watch-tower on the island of Pharos, in the port of Alexandria, Egypt was completed by King Ptolemy Philadelphus, 265-247 B.C. This lighthouse about 600 ft. in height was built by a Greek architect Sostratus of Cnidus and was the first of its kind in the world. The science of lighthouse construction called *Pharology* started with this lighthouse. *Pharos* simply means a beacon and even today the French word *Phare*, meaning lighthouse, reminds one of the old Pharos of Alexandria.

Other Wonders

The Sphinx, near Gizeh in Egypt, is a great wingless crouching lion hewn out of solid rock, 172.5 feet long, and 66 feet high. Between the two extended paws is a granite altar with inscriptions apparently indicating that it was built during the time of the Fourth Dynasty, around 2500 B.C.

The Great Wall of China, built in the third century B.C. extended along the northern frontier of the country, from the northern part of the Gulf of Chihli on the Yellow Sea, north

of Peking, in a zigzag course, to Syning, on the border of Turkestan.

The total length of the Wall is 3219 kilometres or about 2000 miles. It has a height of 6 to 15 metres and a width of 4.5 to 7.6 metres. The Towers erected at intervals in the Wall are 9 metres high and 6 metres wide.

Stonehenge is a circular assemblage of huge, shaped stones in Salisbury plain about 90 miles south west of London. The stones are arranged in two circles one within the other. The outer circle is 100 feet in diameter and the inner 75 feet. The stones in the outer circle were fastened together in couples by blocks fixed across the tops. It appears to have been put up between 1800 and 1500 B.C., presumably for religious purposes. The name Stonehenge is a corruption of Stanhangest (stone horse).

The Catacombs at Rome were the sepulchres of the early Christians, and consisted of more than 40 groups of labyrinths, or galleries and chambers, covering 615 acres, sometimes, going down to 5 storeys (70 feet) below the surface of the ground.

The Circus Maximus at Rome, built 605 B.C. by King Tarquin and rebuilt and enlarged by Julius Caesar, was 312 feet high, 1875 feet long and 625 feet wide. It then held 150,000 spectators, but the capacity was increased to 385,000 in the fourth century A.D. The place was used for games and for horse and chariot races.

The Coliseum, or Colosseum at Rome, one of the largest amphitheatres in the world, was begun by the Emperor Vespasian and finished by the Emperor Domitian in 82 A.D. In 238 A.D. a fourth storey was added. The ruins still stand. The building, elliptical, was 615×510 feet. The walls were of stone, the seats marble. Fifty thousand persons could sit and 20,000 stand.

The Coliseum is notorious in history as the place where unarmed Christians were made to confront wild animals like lions and tigers in a 'kill or be killed' fight.

Hagia Sophia or the Church of St. Sophia at Constantinople (Istanbul) was built as a Christian cathedral by the Roman Emperor Justinian in 531—538 A.D. It was designed in the form of a Greek cross 269×143 feet with a flattened dome 180 feet high set in a cluster

of cupolas and minarets. It was the most celebrated Christian church of the times. In 1453 Constantinople fell to the Sultan of Turkey who converted Hagia Sophia into a mosque. It was as a mosque that Hagia Sophia acquired the tall pinnacles that surround the central dome today. Hagia Sophia is now a museum.

The Leaning Tower of Pisa is one of the so-called wonders of the Middle Ages. It is a round, 8-storey bell-tower and was built of marble in 1154 A.D.; it is 188 feet high, and the top is 16 feet out of the perpendicular. The Tower was begun in 1174 AD by the architect Bonannus of Pisa and completed in 1350. There are other leaning towers at St. Moritz, Ems, Ulm, Asinelli and Garisenda.

The Porcelain Tower of Nanking was built in that ancient capital of South China in the early part of the 15th century. It was an octagonal 8-storey tower, 261 feet high. The Taiping revolutionists destroyed it in 1853.

The Taj Mahal at Agra, popularly called The Taj, is a masterpiece of architecture that easily takes its place among the Wonders of the World. It is a mausoleum built by the Mughal Emperor Shah Jehan over the tomb of his wife, Empress Mumtaz Mahal. Its construction was started in 1631 and completed in 1653.

The Taj marks the high-water mark of Indo-Persian architecture. It is a domed structure rising above a basement, which itself rests on a great platform or terrace. The keynote of the general layout of the complex lies in the formal garden within the inner court, with a central tank and canals. The garden consists of 4 flowerbeds surrounded by shallow canals studded with fountains, all radiating from the central tank like the arms of a cross. The Taj occupies the northern extremity of this garden, with the River Jamuna at the back.

In shape, the Taj is an irregular octagon with four long and four short sides. Graceful minarets rise from the four corners of the basement. Four magnificent *Chhatris* or kiosks surround the majestic central dome, which is estimated to weigh 12,192.56 metric tons.

The whole structure is done in pure white marble, with the inner walls or partitions exquisitely ornamented and inlaid with pre-

cious stones.

The salient features of the Taj are the broad and superb construction, pure and soft outlines, and luxuriant execution which make it an unparalleled creation of beauty and splendour. The whole complex is so planned that its apparent organic unity does not obscure the individuality of any unit.

Angkor Wat or Nakhon Wat is a temple in Kampuchea, dedicated to Vishnu. It was built during the reign of Suryavarman II. The temple and its enclosure cover an area of 1303×1499 metres. The temple itself is at the top of a series of terraces dotted with smaller temples. The first terrace is 45 feet high. Thousands of sculptures decorate the passages between the shrines on every terrace. The central tower crowning the whole complex is 215 feet high.

The temple is situated south of the Angkor city which was the capital of ancient Cambodia. The city built between 800 and 1200 A.D. is magnificent in its own right. Both the city and the temple appear to have been abandoned around 1500 A.D. The forests advanced upon them and overwhelmed them. In 1858 a French naturalist, Henri Mouhout, discovered the ruins in the jungle and they, or what remained of them, were restored. The city and the temple testify to the spread

of Indian culture in south east Asia.

The Alhambra at Granada in southern Spain was built by the conquering Arab Moors who established a Caliphate in Spain with Cordoba as the first capital. When the Christians reconquered Cordoba, the Caliphate capital was removed to Granada. The Alhambra consists of a fortress whose walls and towers are in red stone and called *Kalat al hambra* (red fort) within which are the *Alcazba*, a palace. This complex of courts and halls, pools and gardens has been described as an 'Arabian Nights Fantasy'. Its architecture is slim and graceful, with slender columns, denticulated arches and exquisite traceries.

Shwe Dagon or the Golden Pagoda is a Buddhist shrine in the outskirts of Rangoon in Burma. It was probably built late in the 13th century or early in the 14th. The spire of the pagoda which was once studded with real emeralds, rubies and other precious stones was added in the 18th century. In 1871 King Mindon Min spent £4.5 million in covering the main dome in gold. The pagoda is built on a mound rising 55 metres and covers an area of nearly 6300 sq. metres. The spire of the pagoda rises 98 metres from the base. The Pagoda is especially sacred to Buddhists because it enshrines 8 of Buddha's hairs which were brought to Burma by two of his disciples.

59. THE SUPERLATIVES

The Superlatives are broadly classified into the Human World, the Natural World and the Scientific World. Man's achievements on the Earth and in outer space are also highlighted.

The first is the *Human World*:

Tallest Man recorded: Robert Pershing Wadlow (1918-40) born at Alton, Illinois, USA; 272 cm (8 ft. 11.5 in). His greatest weight was 491 lb (222.91 kg).

Tallest Living Man: Mohammad Alam Channa, born in 1956 in Pakistan. 251 cm (8 ft. 3 in). He weighs 208 kg (458 lb).

Tallest Woman recorded: Zeng Jinlian (pronounced San Chung Lin) (964-82) of China. 247 cm (8 ft. 1 in).

Tallest Living Woman: Sandy Allen of Canada: 271.7 cm (7 ft. 7¼ in). She now weighs 462 lb (210 kg).

Heaviest Man: Jon Brower Monnoch (1741-83), Washington, USA. He weighed 635 Kg (1400 lb).

Heaviest Woman: Percy Pearl of Washington, USA (1926-1972). 399 kg (880 lb).

Oldest Man ever lived (Authenticated): Shigechiyo Izumi, Japan (1865-1983). Born on June 29, 1965, he was recorded as a 6-year-old in Japan's first census of 1871. He died at the age of 118.

Most Children: The greatest officially recorded number of children produced by a mother is 69 by the first of the two wives of Feodor Vassilyev (1707-1782) of USSR. In 27

confinements she gave birth to 16 pairs of twins, 7 sets of triplets and 4 sets of quadruplets.

Most Prolific Mother (living): Leontina Albina (b. 1925), Chile. She was reported to be pregnant in Nov. 1980 having already produced 44 children.

First Siamese Twins: Chang and Eng Bunker (Known in Thailand as Chan and In) born at Meklong on May 11, 1811 of Chinese parents. They died within three hours of each other on Jan. 17, 1874, aged 62.

First Test Tube Baby: Louise Brown (5 lb 12 oz) (2.6 Kg) was delivered by Caesarian Section from Lesley Brown, 31, in Oldham General Hospital, Lancashire, England at 11.47 p.m. on July 25, 1978.

Fastest Human Mind: The fastest extraction of a 13th root from a 100 digit number is in 1 min. 28.8 sec by William Klein of Netherlands on April 7, 1981. **Mrs. Shakuntala Devi of India** demonstrated the multiplication of two 13 digit numbers 7,686,369,774,870 $\times$ 2,465,099,745,779 picked at random by the computer department of Imperial College, London on June 18, 1980, in 28 sec. Her answer: 18,947,668,177,995,426,462,773,730.

First Human Heart Transplant: Was performed on Louis Washkansky, 55, at the Groote Schuur Hospital, Cape Town, S. Africa on Dec. 3, 1967 by a team of 30 led by Prof. Christian Neethling Barnard. The donor was Miss Denise Ann Darvall, aged 25. Washkansky died on Dec. 21, 1967.

First Artificial Heart: Dr. Burney B. Clark, 61, of Wisconsin, USA received the first artificial heart on Dec 1-2, 1982 at the Utah Medical Centre, Salt Lake City, Utah. The Surgeon was Dr. William C de Vries. The heart was a mark 7 Jarvik 7 designed by Dr. Robert Jarvik. Dr. Clark died on March 23, 1983, 112 days later.

Natural World

Largest and Heaviest Animal: The Blue or Sulphur-bottom Whale. The largest specimen ever recorded was a female landed at Falkland Islands, during 1904-20. She measured 33.58 m (110 ft. 2.5 in) in length. Another female measuring 27.6 m (90 ft. 6 in) was caught in the Southern Ocean by the Soviet 'Slava' whaling fleet on March 20, 1947, weighed 190 tonnes.

Tallest Living Animal: the Giraffe, now found only in the dry Savannah and semi-desert

Problem Man

New York: The world's tallest man, Mohammad Alam Channa, caused traffic jams when he walked down New York's Fifth Avenue and lunch-time crowds milled around him.

Channa, a Pakistani, who stands 8 feet and 3 inches, was on a visit to the United States.

Dazed Americans jostled to shake hands with the 491-pound Channa as American television crews and photographers recorded the event.

"I thought I was tall" exclaimed a six-foot basketball player straining to look at Channa's face.

(IINA: Aug. 25, 1985)

areas of Africa. The tallest ever recorded was a Masai bull named 'George' received at Chester Zoo, England on Jan. 8, 1959, from Kenya. His horns almost touched the roof of the 20 ft. (6.09 m) high Giraffe House when he was 6 years old. George died on July 22, 1969.

Fastest Moving Animal: The Peregrine Falcon, which has been timed electronically at 350 km/h (217 m/h) in 1963 in Germany while making a stoop at a 45° angle of descent. The fastest bird in level flight is the white-throated Spinetail Swift of Asia. In 1942 air speed upto 171 km/h (106.25 m/h) was recorded for this species in the USSR.

Largest Living Animal: The African bush elephant. The average adult bull stands 10 ft. 6 in (3.2 m) at the shoulder and weighs 5.7 tonnes. The largest specimen ever recorded was a bull shot in Southern Angola on Nov. 7, 1974. It had a height of 13 ft (3.96 m).

Fastest Land Animal over short distance (ie upto 60 yd (549 m): The Cheetah or Hunting Leopard of the plains of East Africa, Iran, Turkmenia and Afghanistan, with a probable maximum speed of 60-63 m/h (95-101 km/h) over suitably level ground.

Tallest Tree: The redwood near coast of California. The tallest measured example is the 'Tallest Tree' in Red Wood Creek Grove, Humboldt County, California, discovered in 1963 to be 367.8 ft (112.1 m). It has a girth of 43 ft. 11 in (13.38 m).

Most Massive Tree: Giant Sequoia named the 'General Sherman' standing 272.4 ft. (83.02 m) tall in the Sequoia National Park, California. It has a true girth of 79.8 ft. (24.32 m) above the ground. This tree has been estimated to contain the equivalent of 600,120 board feet of lumber sufficient to make 5,000,000,000 matches.

Most Massive Tree Canopy: The Great Banyan (*Ficus bengalensis*) in the Indian Botanical Garden, Calcutta where some 1,000 subsidiary trunks are formed from aerial roots. It covers some 4 acres (1.6 ha) and is believed to date from c. 1770.

Largest Forest: The vast Coniferous forests of the northern USSR, lying mainly between latitude 55°N, and to Arctic Circle. The total wooded area amounts to 2,700,000,000 acres or 1100 million ha (25 percent of the world's forests), of which 38 percent is Siberian larch.

Largest Park: The Wood Buffalo National Park in Alberta, Canada established in 1922 has an area of 11,172,000 acres (17,560 sq. miles or 4548 sq. km.)

Greatest Rainfall (24 hrs): 73.62 in or 1870 mm. Cilaos La Reunion, Indian Ocean, March 15-16-1952. **Greatest Rainfall (Calendar month):** 366.14 in or 9299 mm, Chirapunji, Meghalaya, India in July 1861. **Greatest Rainfall (12 months):** 1041.78 in (26,461 mm) Cherapunji, Meghalaya, India, 1-8-1860-31-7-1861.

Maximum Sunshine: 97 percent (over 4300 hrs), eastern Sahara, annual average. **Hottest place:** (Annual mean): Dallol, Ethiopia: 94° F or 34.4 c (1960-66).

Longest Drought: c. 400 years to 1971. Desierto de Atacama, Chile.

Coldest Place (Extrapolated Annual Mean): Polus Nedostupnosti, pole of Cold (78° S (96°E), Antarctica, -72°F or -57.8°C. **Coldest measured means:** -70°F or -56.6°C. Plateau Station, Antarctica. **Wettest place (Annual Mean):** Mt. Wai-ale-ale (5,148 ft (1569 m) in Kauai, Hawaii, 451 in (11455 mm), average 1920-72. In 1948, 621 in (15773 mm).

Largest Ocean: the Pacific; representing 45.8 per cent the World's Oceans it covers an area of 64,186,000 sq. miles or 166240000 sq. Km.

Deepest part of Ocean: in the Marianas Trench in the Pacific Ocean; has a depth of

5968 fathoms (35,808 ft or 10914 m) or 6.78 miles (10.91 km).

Largest sea: the South China Sea with an area of 1,148,500 sq. miles or 2974600 sq. km.

Longest Straits: the Tatarskiy Proliv or Tartar Straits between Sakhalin Island and the USSR mainland, running from the Sea of Japan to Sakhalinsky Zaliv. This distance is 800 km or 497 miles-- thus marginally larger than the Malacca Straits.

Largest Gulf: the Gulf of Mexico, with an area of 580,000 sq. miles or 1500,000 sq. km, and a shoreline of 3100 miles or 4990 km from Cape Sable, Florida, to Cabo Catoche, Mexico.

Largest Bay: measured by shore-line length is Hudson Bay, Northern Canada, with a shoreline of 7,623 miles or 12268 km with an area of 317,500 sq. miles or 822300 sq. km. The area of Bay of Bengal is however 839,000 sq. miles or 217200 sq. km.

Largest Land Mass: The Eurasian land with an area (including Islands) of 20733,000 sq. miles or 53698,000 sq. km.

Smallest Land Mass: the Australian Minland with an area of 2,941,526 sq. miles or 7618493 sq. Km which, together with Tasmania, New Zealand, New Guinea and the Pacific Islands is sometimes described as Oceania.

Largest Peninsula: Arabia with an area of 1,250,000 sq. miles or 3250000 sq. km.

Largest Island: Discounting Australia, which is usually recorded as a continental land mass, the largest island is Greenland (Renamed Kalaatdlit Nunaat, May 1, 1979), with an area of about 840,000 sq. miles or 2175,000 sq. km.

Greatest Archipelago: 3,500-mile or 5600-km long crescents of more than 13,000 islands which form Indonesia.

Highest Mountain: Eastern Himalayan peak of 29,028 ft. or 8848 metre above sea level on the Tibet- Nepal border, named Mount Everest having 5½ mile or 8.85 km height. The peak was named after Col. Sir George Everest (1790-1866), formerly Surveyor General of India.

Largest Lake (Inland Sea): the Kaspiskoye More (Caspian Sea) in the Southern USSR and Iran. It is 760 miles or 1225 km long and its total area is 360700 sq. km or 13,900 sq. miles.

Largest Fresh Water Lake: Lake Superior, one of the Great Lakes of N. America, has the greatest surface area in the world. Its total area is 31800 sq. miles or 82350 sq. km. The fresh Water Lake with the greatest volume is the Baykal, in Siberia, USSR, with an estimated volume of 5,520 cubic miles or 23000 cubic km.

Largest Desert: The Sahara in N. Africa. At its greatest length it is 3200 miles or 5150 km from east to west. From North to South, it is between 800 and 1400 miles or 1275 and 2250 km. Area covered by the desert is about 3,250,000 sq. miles or 8400000 sq. km.

Highest Water Fall: Salto Angel Falls in Venezuela on a branch of the river Carrao. It has a total depth of 3,212 ft or 979 metre.

Longest River: The two longest Rivers in the World are Amazon, flowing into the South Atlantic and the Nile, flowing into the Mediterranean. Which is longer is more a matter of definition than simple measurement. The Amazon has a length of 4007 miles or 6448 km. The length of the Nile is 4145 miles or 6670 km. However, the length of these rivers vary if measured in different courses.

SCIENTIFIC WORLD

Largest Planet: Jupiter, with an equatorial diameter of 88,846 miles or 142984 km and a polar diameter of 83,082 miles or 133708 km. is the largest of the 9 major planets, with a mass of 317.83 times, and a volume of 1,321.4 times that of the Earth.

Smallest Planet: Pluto with a diameter of about 3000 km or 1880 miles and the mass is about 1/500 of the Earth.

Fastest Planet: Mercury, which orbits the Sun at an average distance of 3,5983,100 miles or 579,092,00 km, has a period of revolution of 87.9686 days, so giving the highest average speed in orbit of 107030 mph or 172,248 km/h.

Earliest Space Craft: Sputnik, owned by USSR, was the first artificial satellite successfully put into orbit on Oct. 4, 1957.

Earliest Manned Satellite: First successful manned space flight took off from USSR on April 12, 1961. Flight Major (later Col) Yuri Gagarin was the first cosmonaut.

Earliest Walk in Space: The earliest instance of Astronaut floating free outside a space vehicle was by Edward H White, for 21

Japanese Live Longest

The Japanese, who outlive the people of every other nation, further extended their life expectancies in 1984.

The average baby girl born in the year is now expected to live for 80.18 years topping the 80-year mark for the first time in human history.

This was up by 0.4 year from the 1983 mark.

A Health and Welfare Ministry survey found that the life expectancy of Japanese males born in 1984 had gone up by 0.34 year to 74.54.

The life expectancy gap between Japanese men and women expanded wide to 5.64 years in 1984 up from 5.58 years a year before.

The report said women lived longer than men in all countries of the world except in India, where the mortality rate among pregnant women is high.

Both Japanese men and women have maintained the top life expectancy of the world since 1982. If the trend continues, people aged 65 or older will account for 15 to 16 per cent of Japan's total population by the turn of this century, compared with 9.9 per cent in 1984, the survey said. It is expected to peak at 22 per cent in 2020.

(Kyodo: July 11, 1985)

minutes on June 3, 1965; Space craft- Gemini-IV.

Man's Longest Time in Space: 221 days by Anatoly Berezovoi and Valentin Lebedev on board the Research Station 'Salyut-7'.

Largest Space Object: The heaviest object orbited is the Apollo-XV, which weighed 138.29 tonnes or 140512 kg.

Tallest Building: Sears Tower, the national headquarters of Sears, Roebuck & Co. in Chicago, USA with 110 storeys, rising to 1,454 ft, or 443 meters. It surpassed World Trade Centre in New York City in height by 100 ft.

Tallest Tower: 'CN Tower' in Metro Centre, Toronto, Canada rises to 1822 ft. 1 in. or 555.33 meters. The tallest tower built before the era of television masts is the Eiffel Tower

in Paris, France. Completed on March 31, 1889, it has a height of 320.75 meters or 1,056 ft. 31 in.

Largest Stadium: Strahov in Praha (Prague), Czechoslovakia. Completed in 1934, it can accommodate 2,40,000 spectators.

Longest Bridge: The longest steel Arch Bridge in the world is New River Gorge Bridge in West Virginia, USA, completed in 1977 with a span of 1700 ft (518.2 meters).

Longest Railway Bridge: Huey P. Long Bridge, Louisiana, USA, which is 4.35 miles or 7 km long.

Highest Dam: The Grande in the Swiss Dinxence Alps, built in 1961, has a height of 935 ft or 285 meters.

Longest Tunnel: For road traffic--the 10.14-mile (16.32 km) long two-lane St. Gotthard road tunnel from Goschenen to Airolo, Switzerland, opened in 1980.

Longest Tunnel: for rail traffic--the 22.2 km (13 miles 1397 Yd) long Oshimizu Tunnel on the Tokyo-Niigata Joetsu line in Central Honshu under the Tanigawa mountain, opened in 1979.

Longest Wall: The Great Wall of China, completed during 246-210 BC, has a mainline length of 2,150 miles or 3460 km.

Largest Passenger Ship: The world's largest and the longest liner is 'Norway' of 70,202.19 grt and 315.60m or 1035 ft 7½ in overall length. Owned by Knut Kloster of Norway.

Largest Cargo Vessel: Liberian ore/oil carrier 'World Gala' of 133,748 Gt or 282,462 dwt with a length of 1,109 ft or 338 m, owned by Liberian Trident Transports Inc., completed in 1973.

Largest Tanker: The world's largest tanker and ship of any kind is the 564,739-tonne deadweight "Seawise Giant", completed for C.Y. Tung in 1981.

Fastest Train: The highest speed recorded on any national rail system is 236 m/h or 380 km/h by the French SNCF high speed train TGV-Train-a Grande Vitesse, inaugurated in 1981.

Longest Rail Line: 9438 Km or 5,864½ miles on the Trans-Siberian line from Moscow to Nakhodka, USSR. There are 97 stops in the journey which takes 8 days 4 hr.25 min.

Largest Air-liner: The highest capacity airliner is the Boeing 747 'Jumbo Jet', first flown in

New Heart Once Again

Heart transplant patient Michael Drummond walked out of University Medical Centre, Tuscon, Arizona on November 14, '85, two and a half months after he became the youngest person to receive a Jarvik-7 artificial heart.

Drummond, 26, wearing a white protective mask over his nose and mouth, walked slowly to a parking slot, and was driven away by his father. He made no comment except to say, "Thank you" to a security officer who wished him good luck.

Drummond, whose heart had become badly diseased, was kept alive for nine days by a Jarvik-7 while doctors searched for a suitable human donor heart.

He received the heart of a Texas auto accident victim on September 7, making him the first Jarvik-7 patient to give up the device for a second human heart.

:(AP: Nov. 15, 1985)

1969. It has a capacity of from 385 to more than 500 passengers, with a maximum speed of 602 m/h or 969 km/h.

Fastest Airliner: The Supersonic BAC-Aerospatiale "Concorde", first flown in 1969, with a capacity of 128 passengers, cruises at up to Mach 2.2 (1450 m/h) or 2333 k/h.

Largest Airport: King Abdul-Aziz International Airport, near Jeddah, Saudi Arabia, covering an area of 40 sq. miles or 103 sq.km. Its Hajj Terminal is the world's largest roofed structure, covering 1.5 sq.km or 370 acres.

Largest Sea Port: Port of New York and New Jersey. It has a navigably wider front of 355 miles or 1215 km. A total of 261 cargo berths and 130 other piers give a total berth capacity of 391 ships at one time.

Busiest Port and Harbour: The World's busiest port and largest artificial harbour is Rotterdam - Europort in Netherlands, which handled 31,565 vessels in 1982.

Largest Airline: The USSR State Airline "Aeroflot", established in 1923. This airline operates 1300 aircrafts over about 560,00 miles or 9,00,000 km and employs about

5,00,000. Carried 1.6 million passengers to 97 countries in 1981.

Fastest Typewriting: The highest recorded speed attained on a manual machine: 1 minute: 170 words--Margerette Owen, USA. machine: Underwood, Standard, on October 21, 1918. 1 hour 147 words (net rate per min.): Albert Tangara, USA. Machine: Underwood Standard, on October 22, 1923.

Largest Armed Force: Chinese People's Liberation Army with 4,230,000, according to 1982 census. Her para-military forces have been estimated at 12 million. In October 1985

China announced intention of reducing strength of PLA by one million.

Most Populous Country: China. The census of July 1982 shows a population of 1,008,175,288. The rate of increase in China is now estimated to be 38700 a day or 14.1 million per day.

Largest Election: that of January, 1980 for the 544 seats of Indian Lok Sabha. There were 362 million voters, from 23 seats and 8 Union Territories, who voted Smt. Indira Gandhi to Power.

60. SOBRIQUETS

Sobriquets are secondary names (including nicknames) that become attached to certain persons, places or things. Thus the Bank of England is known as the Old Maid of Threadneedle Street, and the Malayala Manorama, the oldest newspaper of Kerala as the Granny of Kottayam.

'Bismarck was known as the Man of Blood and Iron' and Florence Nightingale is famous as 'the Lady with the Lamp'. Tippu Sultan of Mysore is still spoken of as the 'Mysore Tiger'.

Some names, as H. W. Fowler observes,

have a large retinue of sobriquets. Rome, for example, may be 'the Eternal City, The City of Seven Hills, the Papal City, the Scarlet Woman, the Scarlet Whore, the Empress of the Ancient World and the Western Babylon'. (M.E.U.)

Sobriquets	Primary Names
Bengal's Sorrow	... River Damodar, Bengal, India
Blue Mountains	... Nilgiri Hills, India
Britain of the South	... New Zealand
City of the Golden Gate	... San Francisco, USA
City of the Golden Temple	... Amritsar, India
City of Dreaming Spires	... Oxford, England
City of Magnificent Distances	... Washington, D.C., USA
City of Palaces	... Calcutta, India
Cockpit of Europe	... Belgium
Dark Continent	... Africa
Emerald Island	... Ireland
Empire City/City of Skyscrapers	... New York, USA
Forbidden City	... Lhasa, Tibet
Garden of England	... Kent, England
Garden of India	... Bangalore
Gate of Tears	... Bab-el-mandab
Gateway of India	... Bombay
Gift of the Nile	... Egypt
Granite City	... Aberdeen, Scotland
Great White Way	... Broadway, New York
Herring Pond	... Atlantic Ocean
Holy Land	... Palestine
Island of Cloves	... Madagascar (Malagasy)

Island of Pearls	...	Bahrain
Key of the Mediterranean	...	Gibraltar
Land of Cakes	...	Scotland
Land of the Kangaroo	...	Australia
Land of the Golden Fleece	...	Australia
Land of the Golden Pagoda	...	Burma
Land of Lilies/Land of Maple	...	Canada
Land of Morning Calm	...	Korea
Land of the Midnight Sun	...	Norway
Land of the Rising Sun	...	Japan
Land of Rivers	...	Punjab, India
Land of Thousand Lakes	...	Finland
Land of the White Elephant	...	Thailand
Never Never Land	...	Prairies of N. Australia
Pearl of the Antilles	...	Cuba
Playground of Europe	...	Switzerland
Powder Keg of Europe	...	Balkans
Quaker City	...	Philadelphia
Queen of the Adriatic	...	Venice, Italy
Queen of the Arabian Sea/Venice of the East	...	Cochin, India
Roof of the World	...	Pamirs
Rose Pink City	...	Jaipur, India
Saint of the Gutters	...	Mother Teresa
Sick Man of Europe	...	Turkey
Sorrow of China	...	River Hwang Ho.
Spice Garden of India	...	Kerala
White City	...	Belgrade, Yugoslavia
White Man's Grave	...	Guinea Coast
Windy City	...	Chicago, USA
World's Bread Basket	...	Prairies of N. America
World's Loneliest Island	...	Tristan da Cunha

61. ABBREVIATIONS

Abbreviations are an accepted form of usage in all developed languages. They save time and space—time in talking and space in writing. It is for this reason that abbreviations have become popular with all and sundry.

Formerly abbreviations were used sparingly. Only well known organisations, products, processes, or projects were indicated by their initials. Today, abbreviations are being bandied about indiscriminately. They are being used for all sorts of things, well known, little known and unknown.

AAPSO: Afro-Asian People's Solidarity Organisation.

ABC: Atomic Biological and Chemical (warfare); Audit Bureau of Circulation.

ABM: Anti-Ballistic Missile

AC: Ante Christum (Before Christ); Alternate Current (electricity); Asoka Chakra

A/c: Account

ACC: Auxiliary Cadet Corps; Associated Cement Companies

AD: Anno Domini (in the year of our Lord)

ADC: Aide-de-camp (Helper or assistant)

ADB: Asian Development Bank

AEC: Atomic Energy Commission

AG: Accountant General; Adjutant General

AH: Anno Hegirae (Mohammed's flight from Makkah to Medina, 622 AD)

AHQ: Air Headquarters or Army Headquarters

AICC: All India Congress Committee

AI: Air India

AIDS: Acquired Immune Deficiency Syndrome

AIMA: All India Manufacturer's (and also Management) Association

AIMO: All India Manufacturers's Organisation

AINEC: All India Newspaper Editors Conference

AIIMS: All India Institute of Medical Sciences
AIR: All India Radio
AM: Ante Meridiem (before noon)
AITUC: All India Trade Union Congress
ANZAC: Australia, New Zealand Army Corps
ANZUS: Australia, New Zealand, United States of America (a term applied to the Pacific Pact amongst these powers)
AOC: Air Officer Commanding
AP: Andhra Pradesh
APC: Agricultural Prices Commission
ARC: Administrative Reforms Commission
ARDC: Agricultural Refinance & Development Corporation
ARP: Air Raid Precautions
ASAT: Anti-Satellite
ASC: Army Service Corps
ASI: Archaeological Survey of India
ASEAN: Association for South East Asian Nations
AVARD: Association of Voluntary Agencies for Rural Development
AVSM: Ati Vishisht Seva Medal

B.A.: Baccalaureus Artium; Bachelor of Arts; British Academy
BARC: Bhabha Atomic Research Centre
BBC: British Broadcasting Corporation
BC: Before Christ
BCG: Bacillus Calmette Guerin (Anti-T.B. Vaccine)
BE: Bachelor of Engineering
BEL: Bharat Electronics Limited
bhp: brake horse power
BENELUX: (A short term for) Belgium, Netherlands and Luxembourg
BHEL: Bharat Heavy Electricals Ltd.
BIS: Bank of International Settlements; British Information Service
BO: Body Odour
BP: Blood Pressure; Before Present*
BPE: Bureau of Public Enterprises
B. Pharm: Bachelor of Pharmacy
BSF: Border Security Force
B Th U: British Thermal Unit

C°: Centigrade
CA: Chartered Accountant
CADA: Command Area Development Agency, India
Cantab: Catabrigian (of Cambridge University)
CARE: Co-operative for American Relief Everywhere
CASA: Church's Auxiliary for Social Action, India
CASTASIA: Conference on the Application of Science and Technology to the Development of ASIA
CBI: Central Bureau of Investigation, India
c&b: caught and bowled (a term in cricket)
CCI: Cricket Club of India
CDP: Community Development Programme
CDS: Compulsory Deposit Scheme
cf: confer (compare)/refer

C.G.S. Chief of the General Staff Centimetre Gram
CGHS: Central Government Health Scheme
CIA: Criminal Investigation Agency; Central Intelligence Agency (USA)
C-in-C: Commander-in-Chief
CID: Criminal Investigation Department
cif: cost, insurance and freight
CIL: Coal India Limited
CIR: Canada India Reactor
CITU: Centre of Trade Unions, India
CJ: Chief Justice
CLRC: Central Land Reforms Committee
CMO: Chief Medical Officer
CO: Commanding Officer
CIWTC: Central Inland Water Transport Commission
Co: Company
C/o: Care of
COFEPOSA: Conservation of Foreign Exchange and Prevention of Smuggling Act
cod: cash on delivery
cp: compare
CORE: Congress of Racial Equality
CPI/CPM: Communist Party of India/Marxist
CR: Central Railway
CRP: Central Reserve Police
CSIR: Council of Scientific and Industrial Research, India
CSO: Central Statistical Organisation, India/Congress of Industrial Organisation
Cwt: Hundredweight
CVC: Chief Vigilance Commissioner

DA: Dearness Allowance
DC: Deputy Commissioner/Direct Current (electricity) District of Colombia
D & C: Dilation and Curettage
DDT: Dichloro-diphenyl Trichloro-ethane
DGTD: Director General of Technical Development, India
DG: Dei Gratia (By the grace of god)
DIG: Deputy Inspector General
disco: discotheque (a place where one can dance to music played on records or discs)
DLO: Dead Letter Office (New name is RLO—Returned Letters Office)
D. Litt: Doctor of Literature
DM: District Magistrate
DMK: Dravida Munnetra Kazagham
DNA: Deoxy-ribose Nucleic Acid
DPI: Director of Public Instruction
DPSA: Deep Penetration Strike Aircraft
D. Sc: Doctor of Science
DV: Deo Volente (God Willing)
DVC: Damodar Valley Corporation
DUSU: Delhi University Students Union

ECA: Economic Co-operation Administration
ECAFE: Economic Commission for Asia and Far East (Now ESCAP)
ECE/A/LA: Economic Commission for Europe/Africa/Latin America

ECG: Electro Cardiogram
ECM: European Common Market
ECOSOC: Economic and Social Council (UN)
EEC: European Economic Community
EEG: Electro Encephalogram
eg: *exempli gratia* (for example)
E-in-C: Engineer-in-Chief
EMG: Electro Myogram
EMF: Electro-Motive Force
EMS: European Monetary System
E&OE: Errors and Omissions Excepted
EPLF: Eritrean's People's Liberation Front
EPNS: Electroplated Nickel Silver
ERDA: Energy Research and Development Administration.
ERP: European Recovery Programme.
ESCAP: Economic and Social Commission for Asia and the Pacific.
ESI: Employees State Insurance.
ESP: Extra Sensory Perception.
etc: *et ceteri* or *et cetera* (and others/and so forth).
et seq: *et sequens* (and what follows).
Ex-officio: By virtue of one's office.

FACT: Fertilisers and Chemicals Travancore Ltd.
FAO: Food and Agriculture Organisation.
FBI: Federal Bureau of Investigation.
FCI: Food Corporation of India, Fertilizer Corporation of India.
FICCI: Federation of Indian Chambers of Commerce and Industry.
FLS: Fellow of Linnaean Society.
FM: Field Marshal.
fob: free on board.
for: free on rail.
FRG: Federal Republic of Germany.
FRCP: Fellow of the Royal College of Physicians.
FRCS: Fellow of the Royal College of Surgeons.
FRS: Fellow of the Royal Society.

GATT: General Agreement on Tariffs and Trade.
GBS: George Bernard Shaw.
GDR: German Democratic Republic (East Germany).
GHQ: General Head Quarters.
GI: Government Issue (a term which is normally applied to the American soldiers).
GMT: Greenwich Mean Time.
GNP: Gross National Product.
GOC: General Officer Commanding.
GOM: Grand Old Man.
GPO: General Post Office.
GRT: Gross Rated Tonnage.

HAL: Hindustan Aeronautics Limited.
HE: His or Her Excellency.
HEC: Heavy Engineering Company.
HEL: Heavy Electricals Limited.
HMI: Himalyan Mountaineering Institute.
HMT: Hindustan Machine Tools.
Hon: Honourable, Honorary.

hp: horse power.
HP: Harmonic Progression; Himachal Pradesh.
HQ: Head Quarters.
Hr: Hour.
HSD: High Speed Diesel.
HSL: Hindustan Steel Limited.
HWM: High Water Mark.
HUDCO: Housing and Urban Development Corporation.

IAMC: Indian Army Medical Corps.
IAA: International Airports Authority.
IA: Indian Airlines.
IAF: Indian Air Force.
IAEA: International Atomic Energy Agency.
IARI: Indian Agricultural Research Institute, Delhi.
IAS: Indian Administrative Service.
IAAS: Indian Audit and Accounts Service.
IATA: International Air Transport Association.
IBM: International Business Machines.
Ibid: *Ibidem*. (the same).
IBRD: International Bank of Reconstruction and Development.
ICAO: International Civil Aviation Organisation.
ICAR: Indian Council of Agricultural Research.
ICBM: Inter-Continental Ballistic Missile (developed by USSR).
ICCR: Indian Council of Cultural Relations.
ICJ: International Court of Justice.
ICMR: Indian Council of Medical Research.
ICS: Indian Civil Service.
ICWA: Indian Council of World Affairs.
IDA: International Development Bank of India.
IDBI: Industrial Development Bank of India.
IDPL: Indian Drugs and Pharmaceuticals Limited.
ie: *id est* (that is).
IENS: Indian and Eastern Newspapers Society.
IFC: Indian Finance Corporation.
International Finance Corporation.
IFS: Indian Foreign Service.
IGY: International Geophysical Year.
IIPA: Indian Institute of Public Administration.
IISCo: Indian Iron and Steel Company
IIT: Indian Institute of Technology.
ILO: International Labour Organisation.
IMF: International Monetary Fund.
IMS: Indian Medical Service.
IN: Indian National Army.
INA: Indian National Army.
in cog: *in cognito*. (unknown).
INS: Indian Naval Ship.
INSDC: Indian National Scientific Documentation Centre.
INTUC: Indian National Trade Union Congress.
INDIPEX: Indian International Philatelic Exhibition.
INSAT: Indian National Satellite.
INTELSAT: International Telecommunication Satellite
lite
INTERPOL: International Police.
infra dig: *infra dignitatum* (below status).
IOC: Indian Oil Corporation.

IOU: I Owe You.

IPC: Indian Penal Code.

ICICI: Industrial Credit Investment Corporation of India.

IPCL: Indian Petro-Chemicals Corporation Ltd.

IPS: Indian Police Service, Inter Press Service.

IQ: Intelligenece Quotient.

IRA: Indian Republican Army.

IRC: International Red Cross.

IRBM: Intermediate Range Ballistic Missile.

IRRI: International Rice Research Institute.

iq: idem quod (the same as).

IQSY: International Quiet Sun Year (1 Jan. 64—31 Dec. 65).

IRO: International Refugee Organisation.

IRS: Indian Revenue Service.

IRTS: Indian Railway Traffic Service.

ISRO: Indian Space Research Organisation.

ISI: Indian Standards Institution.

IST: Indian Standard Time.

ISSP: Indian Scientific Satellite Project.

ITBF: Indo-Tibe in Border Force.

ITI: Indian Telephone Industries; Industrial Training Institute.

ITO: International Trade Organisation; Income-Tax Officer.

ITU: International Telecommunication Union.

ITUC: Indian Trade Union Congress.

ITY: International Tourist Year.

IUCD: Intra Uterine Contraceptive Device.

JAL: Japan Air Lines.

JCO: Junior Commissioned Officer.

JP: Justice of the Peace.

KANU: Kenya African National Union.

KG: Knight of the Garter; Kindergarten.

KGB: Komitet Gosudarstvennoy Bizo Pasmoti (Russian Secret Police).

KKK: Ku Klux Klan (U.S. Secret Society—Anti-negro, Anti-Jewish).

KMT: Kuomintang (Chinese National Party).

LASER: Light Amplification by Stimulated Emission of Radiation.

LD: Lok Dal.

Lib: Liberation.

Lit.D: Doctor of Literature.

LIC: Life Insurance Corporation (of India).

LL.B: Bachelor of Laws.

LL.D: Doctor of Laws.

LL.M: Master of Laws.

loc cit: loco citato (at the place quoted).

LPG: Liquefied Petroleum Gas.

Li: Lieutenant.

La. Col.: Lieutenant Colonel.

LSD: Lysergic acid di-ethylamide.

M: Monsieur (Mister).

M.A: Magister Artium (Master of Arts).

MASER: Micro-wave Amplification by Stimulated

Emission of Radiation.

M.B: Bachelor of Medicine.

MBA: Master of Business Administration.

MBBS: Bachelor of Medicine and Bachelor of Surgery.

MBE: Member of the British Empire.

MC: Military Cross; Member of Council; Municipal Committee; Municipal Commissioner; Medical Certificate.

MCC: Marylebone Cricket Club.

M.D: Doctor of Medicine.

Mlle: Mademoiselle (Miss).

Miles: Mesdemoiselles (Plural of Miss).

Mme: Madam (Mrs.).

Mmes: Mesdames (Plural of Mrs.).

MI: Military Intelligence.

MISA: Maintenance of Internal Security Act.

MIRV: Multiple Independently Re-entry Targetable Vehicle.

Misc: Miscellaneous.

MIT: Massachusetts Institute of Technology, USA.

MKS: Metre Kilogram Second (System).

MLA: Member of Legislative Assembly.

MLC: Member of Legislative Council.

MLF: Multilateral Force.

MMTC: Minerals and Metals Trading Corporation.

MNC: Multi-National Corporation.

MP: Member of Parliament, Madhya Pradesh.

MPLA: People's Movement for Liberation of Angola.

mph: miles per hour.

MRA: Moral Re-Armament.

MRCP: Member of the Royal College of Physicians.

MRCS: Member of the Royal College of Surgeons.

MRTPC: Monopoly & Restrictive Trade Practices Commission.

M.Sc.: Master of Science.

MS/MSS: Manuscript/Manuscripts.

MVC: Maha Vir Chakra.

NABARD: National Bank for Agriculture and Rural Development.

NAEP: National Adult Education Programme.

NASA: National Aeronautics and Space Administration (U.S.A.).

NATO: North Atlantic Treaty Organisation.

NAYE: National Alliance of Young Entrepreneurs.

NB: Nota Bene (note well).

NCC: National Cadet Corps.

NCDC: National Coal Development Corporation.

NCST: National Committee on Science & Technology.

NCERT: National Council of Educational Research and Training.

NCO: Non-Commissioned Officer.

NDA: National Defence Academy.

NDF: National Defence Fund.

NDC: National Development Council.

NDS: National Discipline Scheme.

NEFA: North-East Frontier Agency.

NFR: North-East Frontier Railway.

NER: Norther Eastern Railway.
NFIR: National Federation of Indian Railwaymen.
NLTA: National Lawn Tennis Association.
NMDC: National Mineral Development Corporation.
non seq: non sequitur (it does not follow).
NOC: No Objection Certificate.
NP: Notary Public.
NPT: Nuclear Non-Proliferation Treaty.
NPC: National Productivity Council (India).
N and Q: Notes and Queries.
NSC: National Service Corps.
NSO: National Sports Organisation.
NSUI: National Students Union of India.
NTP: Normal Temperature and Pressure.
NR: Northern Railway.
NVF: National Volunteer Force.

O & M: Organisation and Methods.
OAS: Organisation for American States.
OAU: Organisation of African Unity. (It was set up in May, 1963).
OBE: Officer (of the Order of the) British Empire.
OC: Officer Commanding.
OCS: Overseas Communication Service.
OECD: Organisation for Economic Co-operation and Development.
OED: Oxford English Dictionary.
OEEC: Organisation for European Economic Co-operation.
OGL: Open General Licence.
OIL: Oil India Limited.
OK: All Correct (Slang).
OAPEC: Organisation of Arab Petroleum Exporting Countries.
OPEC: Organisation of Petroleum Exporting Countries.
OTS: Officer's Training School.
OXFAM: Oxford Committee for Famine Relief.
Oxon: Oxoniensis (of Oxford University).
OIGS: On India Government Service.
ONGC: Oil and Natural Gas Commission.
op cit: opero citato (in the work cited).

PA: Personal Assistant; Press Association.
PAC: Provincial Armed Constabulary.
PDA: Preventive Detention Act.
PAYE: Pay As You Earn.
pc: per centum; post card.
PEC: Project and Equipment Corporation.
PEN: (International Club of) Poets, Playwrights, Essayists, Editors and Novelists.
Perks: Perquisites of Office.
Per pro: Per procuracionem (By the agency of per centum (per hundred)).
Ph.D: Doctor of Philosophy.
PIB: Press Information Bureau.
PIN: Postal Index Number.
PKI: Partai Komunis Indonesia (Communist Party of Indonesia).
PL480: Public Law 480 (Enactment in US under

which foreign aid is given).
PM: Post Meridiem; Prime Minister.
PMG: Post Master General.
P&O: Peninsular and Oriental (Steamship) Co.
POW: Prisoner of War.
PRD: Prantiya Raksha Dal.
PRG: Provisional Revolutionary Government.
Pro-term: Pro tempore (for the time being).
PS: Post Scriptum (written after); Private Secretary, Personal Secretary.
PPS: Post Post Scriptum (additional post script).
PSP: Praja Socialist Party.
PT: Physical Training.
PTI: Press Trust of India.
PTO: Please Turn Over.
PVC: Param Vir Chakra.
PVSM: Param Vishisht Seva Medal.
PWD: Public Works Department.

Q: Queue.
QED: Quod Erat Demonstrandum (that which was to be demonstrated).
QMG: Quarter Master General.
qv: quod vide (which see).

RADAR: Radio Detecting and Ranging.
R&D: Research and Development.
RAW: Research & Analysis Wing.
RBI: Reserve Bank of India.
RCC: Reinforced Cement Concrete.
rd: refer to drawer.
RIP: Requiescat in pace (May he or she rest in peace).
RITES: Rail India Technical & Economic Services.
RLO: Returned Letters Office.
RMS: Railway Mail Service.
RN: Royal Navy.
RNA: Ribo Nucleic Acid.
RNAC: Royal Nepal Airlines Corporation.
RPM: Revolutions Per Minute.
RRC: Reactor Research Centre.
RSVP: Respondez Sil vous plait (Reply if you please).
RSS: Rashtriya Swayam Sewak Sangh.

SAARC: South Asian Association for Regional Co-operation.
SAIL: Steel Authority of India.
SALT: Strategic Arms Limitation Talks.
SAM: Surface to Air Missile.
SAS: Small Astronomy Satellite.
SC: Supreme Court; Security Council.
SCI: Shipping Corporation of India.
SCRA: Special Class Railway Apprentices.
SDO: Sub-Divisional Officer.
SDR: Special Drawing Rights.
SEATO: South-East Asia Treaty Organisation.
SITE: Satellite Instructional Television Experiment.
SHAPE: Supreme Headquarters of Allied Powers in Europe.
SLFP: Sri Lanka Freedom Party.

SLV: Satellite Launch Vehicle.
SP: Superintendent of Police.
SPCA: Society for the Prevention of Cruelty to Animals.
SPCK: Society for the Promotion of Christian Knowledge.
SR: Southern Railway.
SS: Steamship.
SSB: Service Selection Board.
SST: Supersonic Transport.
STARS: Satellite Training And Ranging System.
STC: State Trading Corporation.
STD: Subscriber Trunk Dialling; Sexually Transmitted Diseases.
SUNFED: Special United Nations Fund for Economic Development.
SVP: Saturated Vapour Pressure.

TA: Territorial Army; Travelling Allowance.
TB: Tuberculosis.
TC: Trusteeship Council (U.N. Organ).
TDA: Trade Development Authority.
TELCO: Tata Engineering and Locomotive Company.
TISCO: Tata Iron and Steel Company.
TMO: Telegraphic Money Order.
TNT: Trinitrotoluene.
TERLS: Thumba Equatorial Rocket Launching Station.
TRACT: Transportable Remote Area Communications Terminal.
TTE: Travelling Ticket Examiner.
TVA: Tennessee Valley Authority.
TULF: Tamil United Liberation Front.
TWA: Trans-World Airlines.

UGC: University Grants Commission.
UK: United Kingdom.
UNAEC: United Nations Atomic Energy Commission.
UNCIP: United Nations Commission for India and Pakistan.
UNCSTD: United Nations Conference on Science & Technology for Development.
UNEP: United Nations Environment Programme.
UNCTAD: United Nations Conference on Trade and

Development.
UNEF: United Nations Emergency Force (UAR).
UNESCO: United Nations Educational, Scientific and Cultural Organisation.
UNI: United News of India.
UNICEF: United Nations International Children's Emergency Fund.
UNIDO: United Nations Industrial Development Organisation.
UNIPOM: United Nations India-Pakistan Observation Mission.
UNRRA: United Nations Relief and Rehabilitation Administration.
UP: Uttar Pradesh.
UPSC: Union Public Service Commission.
USA: United States of America.
USAID: United States Agency for International Development.
USI: United States of Indonesia.
USSR: Union of Soviet Socialist Republics.

VAT: Value Added Tax.
VC: Vice-Chancellor, Victoria Cross.
VD: Venereal Disease (see STD).
VCO: Viceroy's Commissioned Officer.
Vr.C: Vir Chakra.
VIP: Very Important Person.
VPP: Value Payable Post.
VVF: Village Volunteer Force (Organised in India since January 1963).

WAY: World Assembly of Youth.
WFTU: World Federation of Trade Unions.
WHO: World Health Organisation.
WMO: World Meteorological Organisation.
WWF: World Wildlife Fund.

Xmas: Christmas.

YMCA: Young Men's Christian Association.
YWCA: Young Women's Christian Association.

ZETA: Zero Energy Thermo-nuclear Assembly or Apparatus.
ZIP: Zonal Improvement Plan.

62 MINERALS AND GEMS

Minerals have played a leading role in the evolution of civilization. Long before man discovered (or invented?) agriculture, he had discovered minerals. They lay handy all around him—pebbles and pieces of rock.

For centuries, these had been his mainstay. Our stone age ancestors were so called, because they carved their tools out of stone. This was the first mineral that man had put to use.

Today we have about 2000 different varieties of minerals—metals and non-metals—and a host of alloys.

Minerals may be classified as Metal, Non-metal and Fuel minerals.

MAJOR MINERALS: *Aluminium*, the third most extensively consumed metal, is the most plentiful of all metals. It comprises 8.1 per cent of the Earth's crust as against 5 per cent represented by iron. The major ore of aluminium is bauxite. But aluminium is present in different forms in all alumina minerals.

Antimony is a metal used in printing types and in medicines and pigments. *Apatite* is a phosphatic compound used in fertilisers, matches and chemicals. *Asbestos*, sometimes known as 'rock cotton', is a group of minerals that can be spun into fibres. They are fire-resistant and are used in roofing, piping and other fittings.

Barytes, also known as 'heavy spar', is a sulphate of barium and is used in smelting iron and manganese and for all barium chemicals. *Bauxite*, the chief ore of aluminium, is used in refractory and chemical industries. *Bentonite* possesses decolouring and purifying properties and is mainly used as a purifier and filler. *Beryllium*, derived from beryl, is rare and costly. It is light and can withstand high temperatures. It is used as an alloy with copper and in X-ray tubes. *Borax*, in the form of boric acid and borates, is used for vitreous enamels, ceramic glaze, in brazing and welding and in medicines and cosmetics.

Cadmium, a scarce metal, is used in electroplating, glass, paints and in storage batteries. *Calcite*, also known as 'Calcspar', is a naturally occurring carbonate of calcium and is used in textiles, paints, ceramics, bleaching powder etc. *China clay or Kaolin* is used in industries like ceramics, refractories, textiles, paper, pesticides and others. *Cobalt* imparts magnetic properties and is used as an alloy with other metals.

Copper, the Oldest metal discovered by man, is extensively used for various purposes and comes next to steel in annual consumption. Some 240 mineral ores contain copper in varying percentages, but the best known ores are *Chalcopyrite*, *Azurite* and *Malachite*. Malachite is an ornamental stone as well.

The high electrical and thermal conductivity of copper makes it indispensable to the electrical industry which consumes about 50 per cent of the total production. Its malleabil-

Leading Producers

Aluminium	USA, USSR, Canada, Japan, Norway.
Copper	USA, USSR, Zambia, Chile, Canada, Japan, Australia.
Gold	South Africa, Canada, USA, Ghana.
Iron Ore	USSR, USA, France, Australia, Canada.
Lead	USA, Australia, USSR, Canada, Mexico.
Manganese Ore	USSR, South Africa, Brazil, India, Gabon.
Steel	USA, USSR, Japan, West Germany, UK.
Tin	Malaysia, Bolivia, USSR, Thailand, China.
Zinc	Canada, USSR, Australia, USA, Peru.

ity and corrosion-resistance make it an ideal alloy with other metals. *Brass* (copper and zinc) and *bronze* (copper and tin) are two of the oldest and commonest alloys of copper.

Cryolite is mainly used in the extraction of aluminium from ore and also in ceramics and glass industries.

Dolomite is a double carbonate of calcium and magnesium and is mainly used in iron and steel, refractory and glass industries.

Felspar is used in the manufacture of earthenware, sanitaryware, enamelled bricks, opalescent glass etc. *Fireclay* is a refractory clay of sedimentary or residual origin. It is mainly used in the manufacture of refractory bricks for high temperature furnaces. *Flourspar* or fluorite is used in enamelling iron, for finishing enamel-ware like bathtubs, as a fluxing material in the manufacture of steel etc. *Fuller's Earth*, so called because it was formerly used for 'fulling', i.e., cleaning woollen fabrics and cloth, is a natural bleaching clay. It is used in refining petroleum, vegetable oil and in the preparation of cosmetics.

Gold, the King of minerals, is used in jewellery, as currency reserve and for industrial purposes. Pure gold being too soft is often alloyed with copper, silver, nickel or palladium. *Graphite*, also known as plumbago or black lead, is a variety of naturally occurring carbon. It is opaque, extremely

resistant to the action of acid and a good conductor of both heat and electricity. It is used in the manufacture of crucibles, in paints and pigment, in foundry facings and for pencil manufacture.

Ilmenite is one of the commercial sources from which the rare metal titanium is derived. It carries about 30 per cent titanium. Ilmenite is used in the production of white pigments, titanium metal and ferro-titanium.

Iron and Steel. Iron is the most extensively consumed metal to-day. Its natural supply is also abundant. It accounts for some 5 per cent of the earth's crust. Pure iron is too soft for use. So, it is hardened by the addition of carbon to form steel and cast-iron. A number of minor metals are used as alloys of steel so as to endow it with additional physical properties. The most common among them are: *Chromium, Cobalt, Manganese, Molybdenum, Nickel, Silicon, Tungsten* and *Vanadium*. These in different combinations and proportions enable steel to perform very different functions.

Kyanite is an aluminium silicate and is an important refractory mineral.

Lead is recovered from the natural ore galena and is an excellent sound and vibration absorbent. Lead has wide ranging industrial applications. It is used as an alloy with other metals, principally antimony and tin. It is used in brasses and bronzes, type-metal, diecasting, water pipes and in the manufacture of pigments.

Magnesium, one of the lightest metals known, is mostly used as an alloy of steel and aluminium. It is specially used in photography, machine tools, conveyor belts, flash bulbs and for flares.

Mercury is one of the heaviest metals and is unique in its being the only metal in liquid form. Mercury is derived from the mineral cinnabar which is a sulphide of mercury. Mercury has diverse uses in industry. It is used in explosives, pigments, paints, printing inks, medicines, dye-stuffs and in other chemicals.

Mica. Two varieties of mica find use in electrical and electronic industries. *Monazite* is a phosphate of the rare earths, a portmanteau compound carrying some 15 rare earth minerals. The strategic metals derived from the monazite sands are *titanium, uranium, thorium* and *zirconium*.

Molybdenum, a hard metal with a high melting point, is mainly used as an alloy with iron and steel. It is a good electrical and thermal conductor and a corrosion resistant.

Nickel is essential in the production of stainless steel. It has very high corrosion resistance and finds application in electroplating, chemical and ceramic industries.

Ochre is a group of natural pigments and occurs in various shades, chiefly yellow, red, green and brown. It is used in colour washes, distempers, oil paints and coloured papers.

Pentlandite, a nickel-iron sulphide, is used in steels and alloys.

Platinum Costliest. Perhaps the costliest metal is usually found in the natural state with a number of other allied metals—*palladium, iridium, osmium, rhodium* and *ruthenium*. Hardened with iridium or ruthenium, platinum is used in jewellery, laboratory equipment, dentistry, electrical industry, etc.

Quartz or Silica is the most common mineral on the Earth's crust. It is chiefly used in glass manufacture and in making refractory bricks for glass furnaces and coke ovens.

Rutile. Rutile, like ilmenite, is a source of titanium. Rutile contains nearly 60 per cent titanium. It is mainly used in the production of arc-welding electrodes.

Salt, either in the form of sodium chloride (common salt) or along with carbonates of calcium and magnesium and their sulphates, occurs in sea water, in brine springs, wells and salt lakes and in rock salt deposits. Salt, apart from its use in culinary preparations, finds extensive use in chemical industries.

Saltpetre or Potassium nitrate is chiefly used in the manufacture of explosives. *Silver* is used in coinage, plate and jewellery and in various industries—photographic, chemical and electrical. *Silimanite*, like kyanite, is a refractory mineral used in glass, ceramic, cement, chemical industries, etc.

Steatite soapstone or talc is a hydrous silicate of magnesium. Massive steatite is cut into panels and used for switch-boards, acid-proof table-tops, laboratory, laundry and kitchen sinks, as well as for linings for furnaces and stoves. Talc powder is extensively used in paint industry, manufacture of porcelain, asbestos products, textiles, polishes and soaps. The purest white kind,

PRECIOUS CORALS

Among the hundreds of Coral species that inhabit the Earth's warmer waters only a few varieties are highly prized for jewellery because of their beauty, hardness or lustre. Like many gems, Coral is almost imperishable. Such types include red, pink, gold, black and bamboo varieties. Precious Corals, like other Corals, are found in many shapes. Some grow into bushes with regular stems and branches, others grow like bamboos or spiral out as wires. Black Coral is often found as wiry growths. The skeletons of all these Corals are formed out of the first secretions of the coral larvae. Once the skeleton is formed, the larvae cling to it in their millions. They form a thin shining layer of living cells covering the skeleton much as bark covers a tree. The skeleton is of the same colour as that of the polyps—red, pink, gold or black as the case may be. If these skeletons are carefully washed, the living polyps fall off leaving the hard shiny core which forms the precious coral.

Precious coral is one of man's earliest discoveries. It is believed that the Neolithic men collected coral by diving into the Mediterranean. The Mediterranean coral, a vivid red, occurs at depths ranging from 30 to 900 feet. The same red variety is found in the Hawaiian waters only below 300 feet. Black coral occurs only between 100 and 350 feet. The more exotic pink, gold and bamboo varieties start at 1150 feet and go down to 1600 feet. Corals grow very slowly. Black precious corals grow at the rate of $2\frac{1}{2}$ inches per year, while pink corals show an annual growth of about one-third of an inch. The total life span of precious corals is about 70 years. The latest and also the strangest discovery is that some varieties of precious corals shed their own light. The bamboo coral, for example, glows in sea depths where no sunlight penetrates.

In Hawaii, precious corals are big business with a turnover of over 500 million dollars.

Source: National Geographic Magazine.

known as French chalk, is used in cosmetics and toilet preparations.

Sulphur or Brimstone is a major constituent in many industrial processes—in the manufacture of sulphuric acid, paper, insecticides and rubber vulcanization.

Tantalum has the strength of steel and is the outstanding metal for corrosion resistance. It is used in precision equipments and surgical instruments. **Tin** is often confused with iron in popular nomenclature like 'tin-can'. Tin is only the bright polishing on iron containers. It is extracted from the mineral ore cassiterite and is used in tin-plating, solders, bronzes, pewter and silk stockings.

Titanium—a silvery white metal occurring naturally in the form of ilmenite—is comparatively light. It is now extensively used in aircraft construction. Titanium and its alloys have a high degree of corrosion-resistance. But being a costly metal, it is not used in cheap manufactures where it is eminently suitable.

Tungsten, one of the hardest metals known, has the highest melting point of all metals (3410°C). It is twice as heavy as iron or steel, has better electrical conductivity than steel and is also a good thermal conductor. It is familiar to all as the incandescent wire in our electric bulbs. It is used in X-ray tubes, photograph needles and others.

Uranium—basic to atomic research—is not found in the free state but occurs in over 100 minerals. Pitchblende containing uranium oxides and torbernite (hydrated copper uranium phosphates) is a rich source of uranium.

Zinc is derived from the natural ore sphalerite which frequently occurs with galena the chief ore of lead. Zinc is used in castings, galvanising iron, in brasses and as oxide in paints, ceramics, rubber and cosmetics. **Zircon**, a silicate, is a precious stone. As oxide it is used in refractories and ceramics. Zirconium metal is used in steel alloys and wireless valves.

Gemstones. Gemstones are select varieties of precious stones that possess attractive colours, sparkle or translucence. They appeal mainly to our aesthetics or sense of beauty. They are highly priced because they occur only in limited quantities in nature.

All gemstones are precious stones but all precious stones are not gems. Diamond, the king of precious stones, is prized as a gemstone only if it has four essential qualities—colour, cut, clarity and carat (weight)—the four Cs as they are called. Only a small percentage of diamonds, around 25 per cent of the total production, qualify as gems.

All precious stones are distinguished by their extreme hardness which is measured on Moh's scale. Diamond, reputedly the hardest, measures 10 on Moh's scale, while ruby and sapphire come second at 9. At one time, diamond, ruby and sapphire alone were considered precious stones and all others were categorised as semi-precious.

Diamonds are the best known and the most outstanding among all precious stones. They are valued according to Carat, Cut and Clarity or the 3 Cs.

Carat is an ancient term referring to the uniform weight of a carob seed. Now, it has been set 1/142 at ounce or 1/5 gram.

Cut refers to the quality of polishing and the shape of the finished diamond. The four most common shapes, are pear, emerald, and the most popular 'brilliant', a round cut with 58 mathematically determined facets, precisely formed to enhance the diamond's refraction, thereby producing gems filled with fire and sparkle.

The beginning of diamond industry is most probably at Golconda in India around 800 BC. Here, diamond diggings continued till about the 1700's. During this period India exported diamond-edged knives to China for cutting jade. The most famous Indian diamonds are: *Hope*, *Orloff*, *Kohinoor*, *Great Moghul* and *Shah*, the last three were owned originally by Shah Jehan.

63. OIL, COAL & FIREWOOD

Oil continues to be the most strategic energy source in spite of all round efforts to find alternate sources. The dwindling stocks of coal and firewood has added impetus to this incessant quest.

Oil and natural gas are very often found together. They are, like coal, derived from the decomposition of small marine plants and animals. Bacteria play an important role in their formation.

Natural crude oil, when refined by distillation, yields several varieties of oil, petrol, kerosene, lubricating oil, paraffin wax, asphalt, etc. These products are useful in synthesising a number of organic chemicals like dyes, plastics, artificial rubber, fertilisers, etc. This has opened up a vast new avenue of industrial products, generally referred to as *petrochemicals*.

Oil Fields: Oil fields are vast areas many square miles in extent and of very great depths, say 5 to 6 miles. They take many millions of years, anywhere between 100 and 600 million, to form. They occur among sedimentary rock formations. (see *Lithosphere* supra). Those fields which lie below

the land surface are called in-shore and those in the sea, off-shore oil fields.

During the last six hundred million years as the basins of the world were accumulating sediments aquatic life thrived. Plankton and similar micro-organisms abounded while higher species were slowly evolving. The remains of these micro-organisms became integrated with the sediments. Terrestrial organic matter — pollens, spores and other debris of dead plants also intermingled with the sediments.

They are mixed with clay and other fine mineral matter. When the water in the clay and sand sediments is pressed out by the weight of the accumulating debris above, clay tends to turn into shale while sands form sandstones. It is the quantity of organic matter in the shale and sandstone that determines the oil and gas contents of the sedimentary rocks.

[in '000 Tonnes]

North America		Congo	4,500
U.S.A.	487,000	Zaire	1,200
Canada	82,000		
		Western Europe	
Caribbean Area		U.K.	125,000
Venezuela	95,000	Norway	34,500
Trinidad	8,000	Germany, Fed. Rep. of	4,100
Colombia	8,550	Austria	1,250
		Spain	2,500
Other Latin America		Netherlands	3,500
Mexico	150,000	France	2,000
Argentina	24,000	Italy	2,400
Brazil	24,000	Denmark	2,335
Ecuador	12,800		
Peru	9,000	Far East	
Bolivia	950	Indonesia	70,500
Chile	1,800	Australia	23,000
		Brunei	8,000
Middle East		India	28,000
Saudi Arabia	235,000	Malaysia	21,000
Iran	105,000	Burma	1,400
Iraq	58,500	Japan	430
Kuwait	58,000	Pakistan	900
Abu Dhabi	36,000		
Qatar	18,800	USSR and Eastern Europe	
Syria	9,000	USSR	615,500
Turkey	2,000	Romania	12,000
Bahrain	2,000	Yugoslavia	4,000
Sharjah	2,700	Albania	3,000
		Hungary	2,000
Africa		Poland	250
Nigeria	68,000	German Dem. Rep.	60
Libya	52,500	Bulgaria	300
Algeria	29,500	Czechoslovakia	95
Gabon	8,000		
Angola	9,500	China	110,000
Tunisia	5,400		
		World Total	2817 002

*Excluding small scale production in Afghanistan, Bangladesh, Cuba, Guatemala, Israel, Mongolia, Morocco, New Zealand, Taiwan and Thailand.

Oil Wells: The oil and gas pressed out of the lower strata of shale and sandstone are usually trapped in a convex shale container, or dome. Such domes form oil wells which are tapped for commercial production. ★

In oil wells the oil is often found as a layer between gas and water. The oil is usually under pressure. Boring or opening a well releases that pressure. The oil flows into the well from the surrounding field seeping through innumerable pores in the sediment. If the pressure in the well is sufficient enough

★ Source. Natural History

the oil rises by itself to the surface or is pumped out. Oil recovered under natural pressure is considered primary production. About 25% of the U.S. production today belongs to this category.

World Production: The total oil production in the world in 1984 was estimated to be 2,817 million tonnes. Of these, North America's share is 579 m. tonnes, Caribbean area 1.01 m. tonnes, other Latin American countries 1.98 m. tonnes, Middle East countries 5.27 m. tonnes, African countries 1.78 m. tonnes, West European countries 1.77 m. tonnes, Far East countries 1.52 m. tonnes, USSR and Eastern European countries 6.37 m. tonnes and China 1.10 million tonnes.

The long drawn out tug of war between international oil companies and petroleum exporting countries culminated in the formation of OPEC (Organisation of Petroleum Exporting Countries) in 1962. Most of the oil companies pitted against the oil producing countries were multi-nationals controlling production in many parts of the world. It was in their option to increase or reduce petroleum production in various countries and to manipulate prices. Very often they played one producing country against another by adopting various devices that affected the economy of the producing states without reducing the companies' profits.

The immediate provocation for the formation of the OPEC was provided by the announcement of oil companies that they were reducing the prices of Middle East crude. This meant that the countries concerned would be losing proportionately. A conference called together at Baghdad in 1962 decided to form the OPEC. This conference was attended by representatives of Iraq, Kuwait, Saudi Arabia (Arab Muslim States), Iran, a non-Arab but Muslim state, and Venezuela, a non-Arab, non-Muslim state in far away South America. These countries at that time controlled 80 per cent of the world oil trade.

Decisive Force: The two main objectives of the OPEC are to protect the interests of the petroleum exporting countries and to eliminate cut-throat competition among themselves. By 1976 the OPEC had expanded to include 13 countries. They held

two-thirds of world's oil reserves and produced half the non-communist world's oil in its heyday in 1979.

The sharp hike in oil prices by producing countries led to a panicky situation around the world in the seventies. Exploration of alternate sources of energy and of new oil reserves began in right earnest. The U.S. made headway in this effort. Britain, rich with North Sea oil, Mexico, Norway and some West European nations followed suit. The U.S.S.R. also implemented a successful programme of oil exploration. The result was the relegation of OPEC to a less strategic role. Today, they account for only 1/3 of world production.

Petro-dollars: The petro-dollars accumulated by oil producing countries sent out shock waves in world economy and there were conscientious attempts by oil-buying developed nations to retrieve the amount by joining hands with them in a comprehensive programme of reconstruction and development.

To finance new economic programmes, the oil producers needed more money and they began producing more oil. Soon there was a price war, which, no OPEC could contain. The mid-eighties saw the beginning of a reversal to the old order of less demand and less revenue. This in effect crushed the economies of *nouve-rich* countries like Mexico in the Western hemisphere and Nigeria in Africa.

Coal is derived from vegetable matter. When trees and other vegetation fall into swamps, and are covered over with soil, they undergo partial decomposition and become *peat*. In peat, the original woody material is generally visible. As more and more peat accumulates, bacteria break up the organic compounds present in it, liberate gases and convert it into *lignite* (brown coal). As more and more gaseous constituents are eliminated, by pressure of sediments deposited on the coal bed, or by pressure from Earth movements, the lignite is converted into various grades of coal.

High grades of coal have a heating value of 7000 kilocalories. Lower grades have only half or a third as much. Coal is classified in two ways: (i) hard coal (anthracite and

various grades of bituminous coal) and soft coal (brown coal and lignite), (ii) coking coal and non-coking coal.

Coking coal has a metallurgical use (making steel) while non-coking coal has thermal uses, that is, when it is heated to provide either heat or steam for the generation of electricity. The ability of different types of coal to form coke (when they are heated in the absence of air) also varies greatly. So what matters is the type of coal mined, not the quantity.

Asian Share: As a proportion of the increased world production, the most striking advances were in Asia, where - starting from a base of existing large output in both cases - production rose 6.9% in China (to 640 million tons) and 9% in India (to 134 million tons). Other areas that reported increases included Eastern Europe, Canada and Australia. Brazil, Colombia and Mexico had big relative increases but they were based on small absolute outputs of about 5 million to 7 million tons. A few countries had decreases, including the U.K.

World production of brown coal also increased. Output in 1982 was 1,061,000,000 tons, an increase of 3.5% over that of 1981. Again the world picture was dominated by East Germany, which accounted for 26% of world production. Europe, including the USSR, yielded 86.4% of the world total.

Japan Imports: Japan continued to be the world's largest importing country, taking 78.5 million tons. Western Europe imported a total of 11.3 million tons; France (22.9 million tons) and Italy (19.1 million tons) were the largest individual country importers in the region.

The coal trade forecasted by Chase Manhattan Bank - quoted by the UN Economic Commission for Europe (ECE) - expected a drop in coal trade even assuming a strong world economic recovery. Furthermore, the proportion of coking coal in world trade would also fall, reflecting the world-wide decline in steelmaking.

The uncertain early prospects for the energy market also had a dampening effect on enthusiasm for developing coal-liquid dispersions that could be handled and burned in equipment originally designed for oil. Mixtures of coal with oil had been

considered for many years since they are cheaper than fuel oil per unit of energy content and are more convenient to use than coal alone.

Pollution: Coal producers and users from the US, Austria, Canada, West Germany and Sweden studied environmental problems in projects in ten countries. Their aim was to increase the use of coal in industry and electricity generation. In their report *Coal Use and the Environment*, published by the Organisation for Economic Co-operation and Development (OECD), they confirmed that these concerns were perceived by industry as one of the major constraints in expanding the use of coal.

They made detailed recommendations, based on 31 case studies, for reducing net pollution levels by nations that were developing balanced energy and environmental policies; taken together, these would achieve the national goals in a cost-effective manner. Specific problems examined included dust emission, sulfur dioxide, oxides of nitrogen, noise and the transfer of pollution across national boundaries.

Responding to widespread public concern, the leading scientific bodies of three countries - the Royal Society of London, the Norwegian Academy of Science and Letters and the Royal Swedish Academy of science - initiated a long-term collaborative program on causes of acidification of surface waters in Norway and Sweden and the implications for fisheries.

Firewood is the third most important source of energy in the world. Wood as a primary source of energy has one great advantage over coal and oil. It is a renewable source.

The land area of the world amounts to some 13.3 billion hectares or 32.8 billion acres. About a third of this area, say 4.1 billion hectares, is classified by the Food & Agriculture Organisation (FAO) as forestland. Most of the major regions of the world except for Asia and the Pacific have at least a fourth of the land under forests. In North & South America and the USSR the total is more than a third.

Nearly half of the timber felled all over the world is consumed as fuel. One estimate shows that out of a total wood harvest of 2

billion cubic metres per year, 990 million go for fuel. The rest is used in industry. So on a global basis the position is satisfactory. But the situation is altogether different when we compare developed and undeveloped countries.

The developed countries as a whole have plenty of forestland and their consumption of wood for cooking and similar purposes is minimal. Thus in USA 98% of the wood produced is used up in industry. Only about 2% is consumed as firewood. On the other hand, with more than 80% of the population dependent entirely on firewood India has only 23% of its land under forest.

Even this small percentage is progressively rendered smaller by encroachments of all kinds for cultivation, habitation, grazing, etc. Zafar Futehally, one of the leading conservationists of India, says, "The total consumption of wood in India is estimated to be 211 million cubic metres. For fuel alone 184 million cubic metres is used. The annual growth of timber is not more than 50 million cubic metres, which means that consumption is 4 times as much as production." The problem in all developing countries is more or less the same.

Energy Potential: Forests have considerable energy potential. For example, if the energy value of wood is taken as 7500

BTU† per pound, the annual net primary production of the world's forests would roughly be 1200 quads (quadrillion) BTU. This is 5 times the total energy used up in the world in 1975, that is, 230 quads BTU. Taking the annual yield from forests to be 13 million metric tons of which half is economically accessible it has been estimated that forestwood can produce one million megawatts of electricity, which is about twice the present generating capacity of the US.

The situation in India is much the same. According to Murad Ali Baig, "...in terms of energy 211 million cubic metres of wood drawn from forests per annum, represent 50% more energy than the annual raising of coal and over twice as much energy as is available from all electric power installations..."

One obvious step to save wood is to reduce wastage by improvements in cooking arrangements. Another is to convert wood into charcoal which would then be less bulky and less costly for transport. This would also enable us to make use of the wood that is otherwise lost in land clearing and in logging operations. But the most constructive step that we can take is to open fuel wood plantations like the casurina plantations in the suburbs of Madras and thus beared the lion in his own den.

64. RENEWABLE ENERGY

Renewable Sources of Energy include all those sources which are being replenished as they are being used up. In other words, they represent sources of energy, that will not run out like coal or oil.

The quantity of coal or oil available for use is limited to the existing resources. When they are exhausted, these sources will be closed for ever.

Thinking men in every country have been alive to this danger and the dire possibility of having to close down all productive enterprises, owing to a shortage of energy sources like coal or oil. When the environmentalists, joined the fray to point out that coal and oil pollute not only the atmosphere but even the oceans and waterways, the necessity of looking for sources of power other than coal and oil was brought home to the world at

large.

The obvious alternative was the Sun, the ultimate source of all energy in the biosphere (see Ch. 32 Biosphere). Investigations were therefore set afoot to harness solar energy. At the same time, other existing sources of energy were also examined with a view to converting them as a permanent renewable source of power.

In heavily wooded States nearly one-fifth of the homes use wood as a primary source of energy. American industry is also turning

† British Thermal Unit.

Source: Scientific American, February 1979.

over to wood in increasing measure. Canada is following the same policy. Developing countries like Brazil and Philippines are also taking up to wood power more and more.

Composts: Forest products are being put to new uses to lighten the energy burden. One of them is making compost heaps to provide energy. Composts are traditionally made for organic manure. The technique is now used to yield energy also in countries like France, which depend precariously on oil imports.

Compost heaps for this purpose are made from brushwood, that is, tough bushes that form the undergrowth in forests. This undergrowth is not otherwise useful. As compost, the tough wood will be shredded up into small bits and heaped, so as to make it ferment.

A compost mound 3 metres high and 6 metres across will yield methane and hot water during fermentation. The fermentation may last for about one and a half years. During this period, an average family can meet all its requirements of energy—hot water, internal heating, cooking gas and motor fuel.

Once fermentation ends, about 50 tons of organic manure will be formed. It is estimated that 1000 hectares of forest can supply 6000 tons of fertilisers every year, 960,000 cubic metres of biogas (equal to 480,000 litres of oil) and millions of litres of hot water at 4 litres a minute. Once cropped, the undergrowth will grow back in about seven years, when the process can be repeated.

Hydel Power: Falling or flowing water is another renewable source of power. It had been used as such from as far back as 85 B.C. However, it is only in recent times, that the technique of producing electricity out of waterfalls was developed. The first hydel plant was put up in 1882 in Appleton, Wisconsin. The U.S. followed up this pioneering attempt to become the leading country in the world for hydro power generation. It is today producing 71,000 megawatts per year.

U.S.S.R. with 47,000 megawatts comes second and Canada with 40,000 third. The developing countries are also resorting to hydel power in a big way—Kariba Dam, Zimbabwe (1,300 megawatts), Aswan High Dam, Egypt (2,100 m.w.), Furnas Project,

Brazil (4,000 m.w.), Guri Project, Venezuela (29,000 m.w.), etc. India is keeping up with advanced countries in this regard.

It is estimated that on a global basis, four times the present installed capacity can be generated, if individual countries pay more attention. In a few countries like Japan or Switzerland almost all workable hydel projects have been taken in hand. But China with 2 big rivers, the Hwango (Yellow River) and Chang Jiang (the Yangtze) can increase its present capacity of 14,000 m.w. to 32,000 m.w. if the necessary capital is invested.

Solar Power can be utilised directly or indirectly—directly for heating or similar purpose and indirectly as a generator of electricity. Solar heater is a simple device by which we can use the Sun's rays directly for heating. It consists of a glass-topped box with a dark bottom which absorbs the incoming sunlight. The glass permits light to stream in unimpeded but traps the heat without allowing it to escape; just as in a green house. Once the heat is trapped it can be used to heat water or the interior of the house. With slight alterations in the mechanism, the solar heater can be used to cook food or distil water.

Israel is the only country in the world that has put this technique into use on a national scale. Today roughly 10% of all the Israeli households rely entirely on solar power. It is expected that by 1990 solar heating units will increase from 400,000 to 650,000. All public buildings are by law compelled to incorporate solar heating systems.

In Asia, the only country that has caught on is Japan. In 1980 over 1.6 million buildings in Japan were using solar heaters. It is planned to increase this number to 7.8 million by 1990 and 12 million by 1995. This means that by 1995, 30% of all buildings in Japan will be fitted with roof top collectors.

Electricity can be generated from sunlight in two ways. One way is by concentrating sunlight on water to generate steam, which is then used to drive an electrical generator as in fossil—or nuclear-fired electrical generating plants. This technology, however, does not appear to be cost effective and is unlikely to go beyond the pilot plant stage.

Photovoltaic Cells are thin wafers of varying shapes and sizes. Single cells for use

in pocket calculators are often less than one-half inch square. Cells can be linked together in arrays that are large enough to cover a rooftop.

The world's first solar-electric village is Schuchuli, one of fifty-three villages on the Papago Indian Reservation in Arizona (US). It was electrified for the first time in Dec. 1978 when its photovoltaic array was turned on. When the switch was thrown in this remote, sun-drenched community of only ninety-six inhabitants, it illuminated fluorescent lamps that replaced kerosene lamps and started a small water pump that replaced a diesel-powered pump.

Eurelios: In December 1980 the construction of Eurelios, the world's first helioelectric power plant, was completed. It went on line at the beginning of 1981, feeding solar electricity into the grid of the Italian Electricity Board (ENEL) at Adrano, Sicily.

The plant design is based on the central receiver principle. Suntracking mirrors (heliostats) reflect direct solar radiation into a central receiver which is suspended above the field. Water is passed through the receiver in which it is converted into steam to drive a turbine coupled to a generator. The electric energy generated is fed into the existing grid.

This way of generating electricity, using the Sun as the primary energy source, is one of the two main techniques. The other is photovoltaic conversion, in which the solar rays are directly converted into electricity via charge separation in a semiconductor. Both technologies are today at about the same investment cost level. Cost reductions are in prospect for both technologies but only construction and operation of actual power plants will allow evaluation of the real energy costs of these technologies.

Winds: Winds release enormous amounts of energy. This was realised from very ancient times, and men have tried by various methods to harness this energy. Wind powered water lifts were in operation in Persia, as far back as 600 B.C. Sailing ships relying entirely on wind power have crossed the high seas to discover new worlds. Much of the economically harnessable wind energy is concentrated along coastlines and in mountain passes.

The U.S., Sweden and Denmark are the leading users of wind power in the world. Sweden and Denmark are poor in fossil fuels—coal and oil—and have to depend greatly on imported oil. With public opinion strongly against nuclear power plants, Denmark has paid special attention to harnessing wind power. Several small scale wind generators have been built and connected to the national electricity grid. Sweden endowed with a belt of strong westerly winds has worked out a plan for the construction of some 3,300 large wind generators, with the potential capacity of 7 large nuclear reactors.

The U.S., which leads other countries in the matter have spent around 200 million dollars between 1973 and 1980 for developing wind generators. It is planned to produce small generators, suitable for homes as well as big turbines which can provide electricity to 2500 average American houses.

Garbage Energy: Organic waste can be converted into energy by various methods, the most promising of which are direct combustion and the conversion of such wastes into alcohol, methane or other storable fuels.

The idea is doubly advantageous, it will eliminate pollution, which is a big enough problem in all cities and provide power at the same time. The Germans had long been burning damp fuel such as lignite and this technology came in handy in burning garbage, which more often than not was wet or damp. So it turned out that when a survey of garbage burning plants was conducted in 1978 as much as three-fourths of the 262 plants were located in Europe. Most of the remainder was in Japan, the U.S. having only 6 such plants.

Not far away, near Rotterdam, the world's largest single waste-burning facility burns more than a million tons of waste annually to fuel a 55-megawatt electrical generating plant. Wastes from many industries—wood waste from forest-based industries, bagasse from sugar industries and cheese, whey, citrus and vegetable wastes from food industries—have been found useful in producing fuel grade alcohol. It has been estimated that four-fifths of the garbage wastes in U.S. can be converted into 500 million gallons of ethanol per year or 0.5% of the gasoline consumption in U.S.

On the farm front livestock manure and crop residues, constitute a huge and self-replenishing source of energy. New technologies have been evolved whereby farm wastes can be converted into energy, namely methane, a natural gas, and the residual waste can be used as fertilisers. This process of digesting livestock manure to produce methane, leaving a sludge that formed an excellent manure was first developed in China in 1978. There were about 7 million methane digestors of this type operating in China. The Indian Bio-gas technique follows more or less the same pattern.

Geothermal Energy: Geo-thermal heat or heat generated in the bowels of the Earth is being re-inforced by radio activity. The heat remains stored up in the interior of the earth, because there are no natural outlets for escape, except the volcanoes. This stock is gigantic and promises to be an inexhaustible source of energy. The richest geo-thermal resources lie along the so-called Ring of Fire that stretches from New Zealand up through New Guinea, the Philippines, Japan, Western Siberia and then down the Western U.S., through Mexico, Central America and the west coast and South America.

Production of geo-thermal electricity is still limited. However, the U.S., Italy, New Zealand, Japan and the Philippines have already started. Total capacity generated by these countries in 1979 was around 2000 m.w. By 1983 it is expected that around 3% of the

electricity produced in the U.S. will be geo-thermal especially in California, Utah, Nevada, Hawaii and New Mexico. U.S.S.R. is planning a super geo-thermal plant, based on the Avashinski volcano on the Kamchatka peninsula, at a depth of 3.5 km (11,500 ft.) which will supply 5,000 m.w. geo-thermal power for 500 years.

Atomic Power: Initially much was made of atomic power as a renewable source of electricity, and a cheap substitute for other power resources. All industrialised countries went in for nuclear power. Among the developing countries, India took the lead by establishing a nuclear generator in 1969. But the fear of radiation and the more potent fear of opening the door to atomic war have acted as a drag on the development of atomic power all over the world.

The U.S. which led every other country in developing atomic power, appears to have given up the attempt at expansion. In any case, Wall Street has ceased to show any interest in atomic power as an industry. This is indicated by the fact that while the supply of atomic power remained stagnant at 1.2% of the total U.S. power, wood has increased its share to 2.6% by 1980.

Nuclear power is expected to account for 310 GW(E) or 11 per cent of the world's electricity-generating capacity, by 1985. The plants on which this estimate is based are either in operation already, or are under construction.

65. LANGUAGES

No one has yet taken a satisfactory count of the world's languages. There are many estimates. They vary by thousands. The main cause of confusion is how to distinguish a language from a dialect.

Linguists have not agreed as to what distinguishes a language from a dialect. In view of this, differing estimates are quite possible—and admissible. We have here adopted the estimate of some French and American linguists who have listed a total of 2796 languages.

Of the 2796 languages mentioned, over 1200 are spoken by American-Indian tribes.

st of which do not number more than a

thousand people. African-Negro groups speak some 700 different languages while the natives of Australia, New Guinea and other Pacific islands account for as many as 500 languages of their own. Add to this an estimated 200 minor languages of Asia of unknown origin and we find that the total number of the world's major languages (spoken by a million or more people) hardly exceeds 160; in other words, the overwhelm-

ing majority of the world's languages, say 85 per cent, are spoken by numerically small groups, while some 15 per cent represent major languages.

Language Families: The world's languages considered as families fall into 10 broad groups. 1. Indo-European, 2. Semito-Hamitic, 3. Sino-Tibetan, 4. Dravidian, 5. Ural-Altaic, 6. Malayo-Polynesian, 7. African-Negro, 8. American-Indian, 9. Caucasian, 10. Miscellaneous.

1. Indo-European Family†. The Indo-European languages may be subdivided into four major divisions. (a) *Germanic* includes English, German, Dutch, Swedish, Danish, Norwegian, and Icelandic. (b) *Romance* includes French, Spanish, Portuguese, Italian and Romanian. (c) *Balto-Slavic* includes Russian, Polish, Ukrainian, Czech, Slovak, Serbo-Croatian and Bulgarian. (d) *Indo-Iranian* group may be conveniently divided into *Iranian* and *Indic* or Indo-Aryan branches. *Sanskrit* or the Indic branch is the original Indo-Iranian language that was brought into India by the Aryan immigrants. It is the earliest of the Indo-European languages to appear in recorded form.

2. Semito-Hamitic Family comprises Arabic, Hebrew, Libyan, Berber, Galla, Amharic (Ethiopia) and Somali languages.

3. Sino-Tibetan Family is dominated by Chinese, which with its many dialects commands 700 million speakers out of a total of about 760 million for the whole family. Tibetan, Burmese, Thai, Japanese and Korean languages form the rest of the family.

4. Dravidian Family includes the major languages of South India, Tamil, Telugu, Kannada and Malayalam.

5. Ural-Altaic Family includes Finnish, Hungarian, Turkish, Mongol and Manchu.

6. Malayo-Polynesian Family comprises Maori (native to New Zealand), Malagasy (Madagascar), Malay and Indonesian.

7. African-Negro group covers the major African languages, Sudanese, Guinean, Bantu, Hausa (Nigeria), Swahili and others.

8. American-Indian Family comprises many languages of the Red Indian tribes and includes the languages of the Eskimos and Aleuts.

9. Caucasian Family consists of a number of small languages like Georgian and Circassian.

10. Miscellaneous. Among the lesser families, the *Austrian family* apparently commanded a wide circulation in very ancient times. It is at present represented by tribal tongues like the *Munda* group in India. The aboriginal languages of Australia, Tasmania and New Guinea apparently belong to this group.

Basque, which is spoken on both sides of the Pyrenees in Europe, appears to be a remnant of a language family called Mediterranean, which has long since disappeared. The present speakers of Basque number nearly a million.

Basque is a very difficult language. The story goes that the devil tried to learn Basque, so as to tempt and ruin the Basques but gave up the attempt in despair. Basque has no affinity to any European language but bears close resemblance to many American-Indian tongues. Some linguists believe that Basque was the language of the lost continent, Atlantis.

The *Ainu*, the language of the white-skinned people of Hokkondo, the northernmost of Japanese islands, the *Hyperborean* tongues of Siberia and Kamchatka and many other minor groups too numerous to mention make up the rest of the world's languages.

Modern Languages: Of the great modern languages, 13 are spoken by 50 million or more people. They are Chinese, English, Hindustani*, Russian, Spanish, German, Japanese, Arabic, Bengali*, Portuguese, Malay (Indonesian), French and Italian. Approximate estimates of speakers of different languages made by various authorities differ greatly, sometimes by millions. This is so because the speakers of different languages are spread over the whole globe and no statistics beyond so-called guestimates are available about them.

Chinese, the first language in point of speakers is mainly confined to China and Manchuria. *Japanese* is first and foremost the native tongue of the people in Japanese islands, but enjoys some currency in Korea and the nearby area of Asiatic mainland. *Malay* is spoken in Indonesia and Malaysia and is understood as far as the Philippines.

† The term Indo-Hittite is now preferred to Indo-European. This will include Anatolian language and Indo-European proper.

* Sea India

Major Languages

Language	No of speakers (in million)	Principal Areas
Chinese†	700	China
English	300	UK, USA, Canada, Ireland, Australia, New Zealand
Russian	200	USSR
Spanish	165	Spain, Latin America
Hindi	153	North India
Japanese	100	Japan
German	100	Germany, Austria Switzerland
Bengali	95	India, Bangladesh
Portuguese	90	Portugal, Brazil
Arabic	90	Middle East North Africa
French	75	France, Belgium Canada, Switzerland
Italian	55	Italy
Indonesian	50	Indonesia
Javanese	45	Java (Indonesia)
Telugu	44	Andhra Pradesh (India)
Tamil	42	Tamil Nadu (India) Sri Lanka
Marathi	41	Maharashtra (India)
Urdu	40	India, Pakistan
Punjabi	40	India, Pakistan
Korean	40	Korea (North & South)
Ukrainian	37	Ukraine (USSR)
Vietnamese	35	Vietnam
Polish	32	Poland
Turkish	30	Turkey
Gujarati	25	Gujarat (India)
Thai	25	Thailand
Malayalam	22	Kerala (India)
Kannada	21	Karnataka (India)
Farsi (Persian)	20	Iran
Burmese	20	Burma
Oriya	19	Orissa (India)
Romanian	18	Romania
Serbo-Croatian	15	Yugoslavia
Hausa	15	Nigeria, Niger
Pushto	14	Afganistan Pakistan
Bhojpuri	14	Eastern India
Sudanese	13	Sudan
Hungarian	12	Hungary
Dutch	12	The Netherlands
Swahili	12	East Africa

Visayan	12	Philippines
Nepali	10	Nepal
Greek	10	Greece
Czech	9	Czechoslovakia
Assamese	8	Assam (India)
Swedish	8	Sweden
Bulgarian	8	Bulgaria
Belorussian	8	Belorussia (USSR)
Sinhalese	8	Sri Lanka
Amharic	8	Ethiopia
Yoruba	8	Nigeria
Madurese	8	Madura (Indonesia)
Ibo	8	Nigeria
Azerbaijani	7	Azerbaijan (USSR)
Sindhi	7	Pakistan, India
Catalan	6	Spain
Chattisgarhi	6	Bihar (India)
Magadhi	6	" do
Maithali	6	" do
Fulani	6	West Africa
Malagasy	6	Madagascar
Uzbek	6	Uzbekistan (USSR)
Malaya	6	Malaysia, Singapore
Chuang	6	China
Tagalog	6	Philippines
Quechua	6	Peru, Bolivia
Danish	5	Denmark
Flemish	5	Belgium
Provencal	5	France
Tartar	5	Tartar (USSR)
Kurdish	5	Turkey, Iraq, Iran USSR
Khmer	5	Kampuchea
Ruanda	5	Randa, Congo
Galla	5	Ethiopia
Norwegian	4	Norway
Marwari	4	Rajasthan (India)
Finnish	4	Finland
Yiddish	4	USA, Israel
Slovak	4	Czechoslovakia
Armenian	4	Armenia (USSR)
Kazakh	4	Kazakhstan (USSR)
Tibetan	4	Tibet
Uighur	4	Sinkiang (China) USSR
Twi	4	Ghana
Malinke	4	West Africa
Sotho	4	Lesotho (Africa)
Zulu	4	South Africa
Xhosa	4	do
Lithuanian	3	Lithuania (USSR)
Georgian	3	Georgia (USSR)
Hebrew	3	Israel
Santali	3	Eastern India

† Including (Mandarin-560 Cantonese-45 Wu-40 Min-38 Hokka-20)

Yi (Lolo)	3	China	Fang	1	Gabon, Cameroon
Minangkabau	3	Sumatra (Indonesia)	Drinka	1	Sudan
Ilocano	3	Luzon (Philippines)	Lingala	1	Congo
Somali	3	Somalia	Mangbetu	1	Congo
Mossi	3	Bourkina Fasao	Rundi	1	Burundi, Congo
Albanian	2.5	Albania	Kamba	1	Kenya
Mongolian	2.5	Mongolia (China)	Luo	1	Kenya
Miao	2.5	China	Sukuma	1	Tanzania
Buginese	2.5	Celebes (Indonesia)	Tigrinya	1	Ethiopia
Kashmiri	2.5	Kashmir (India)	Shona	1	Zimbabwe
Rajasthani	2	Rajasthan (India)	Tswana	1	Botswana
Moldavian	2	Moldavia (USSR)			South Africa
Lao	2	Laos			
Achinese	2	Sumatra (Indonesia)			
Balinese	2	Bali (Indonesia)			
Bikol	2	Luzon (Philippines)			
Ganda	2	Uganda			
Nyanja	2	Malawi, Zambia			
Mbunda	2	Angola			
Makua	2	Mozambique			
Afrikaans	2	South Africa			
Mayan	2	Mexico, Guatemala			
Guarani	2	Paraguay			
Latvian	1.5	Latvia (USSR)			
Slovenian	1.5	Yugoslavia			
Mordvin	1.5	Mordavia (USSR)			
Chuvash	1.5	Chuvash (USSR)			
Tadzhik	1.5	Tadzhikistan (USSR)			
Gondi	1.5	East India			
Shan	1.5	Burma			
Karen	1.5	Burma			
Batak	1.5	Sumatra (Indonesia)			
Sidamo	1.5	Ethiopia			
Kikuyu	1.5	Kenya			
Kongo	1.5	Congo			
Luba	1.5	Congo			
Bemba	1.5	Zambia			
Bhili	1	Gujarat (India)			
Welsh	1	Wales			
Breton	1	Brittany (France)			
Macedonian	1	Macedonia			
		(Yugoslavia)			
Estonian	1	Estonia (USSR)			
Bashkir	1	Bashkir (USSR)			
Turkmen	1	Turkmen (USSR)			
Kirgiz	1	Kirgiz (USSR)			
Baluchi	1	Pakistan, Iran			
Dayak	1	Borneo (Indonesia)			
Tulu	1	Karnataka (India)			
Wolof	1	Senegal			
Mende	1	Sierra Leone			
Ewe	1	Ghana, Togo			
Fon	1	Dahomey			
Kanuri	1	West Africa			

Arabic covers an incredibly huge area from Africa right across Asia and is learned wherever Islam predominates, though it is almost everywhere mingled with other languages of non-Arabic stock like Berber, Cushite and Hebrew.

English covers nearly one-fifth of the Earth's surface. It is spoken by 200 million people in the western hemisphere and includes over 60 million in Europe, some 25 million in Asia, about 5 million in Africa and more than 13 million in Oceania, comprising Australia and New Zealand.

Russian dominates one-sixth of the total area of the Earth, being the national language throughout the Soviet Union. But Russian is used as a native tongue only by half the population of Soviet Russia. The rest speak some 145 different languages.

Spanish appears in its homeland Spain and the ex-Spanish colonies. But these account for only a quarter of the Spanish-speaking population. The rest (three-fourths) are in the western hemisphere, covering Mexico, Central America, Cuba, Puerto Rico, the Dominican Republic and all South American countries barring Brazil and the Guineas.

Portuguese is spoken in Portugal and the ex-Portuguese colonies. But the greatest number of Portuguese speakers is concentrated in Brazil.

German is practically confined to Europe where it is spoken in Germany, Austria and most of Switzerland. But it enjoys wide currency as a scholastic language all over Europe, especially in Czechoslovakia, Poland, the Netherlands, Hungary, Yugoslavia, Sweden and Norway, where it is spoken by an estimated 20 million people.

French is the language of France, part of Switzerland, Belgium ex-French possessions

or Departments overseas and Canada (especially the province of Quebec). It is reputed as a language of culture in Europe, and is spoken by some 5 million non-French men, in addition to their mother tongues.

Italian, the language of Italy, is current in

the former Italian colonies, Eritrea, Somaliland, Libya and Cyrenica and is used by Italian emigrant groups numbering some 10 million, living in various Mediterranean countries, and USA, Argentina, Brazil, Uruguay and Chile.

66. RELIGIONS

Religions have played a very great part in the evolution of human civilization and culture. They evolved as a set of beliefs concerning the cause, nature and purpose of the universe and grew as an organised system of beliefs that bound people to become a close-knit society. Very often the religions spread out from the lands of their origin.

Hinduism, has left its permanent impact on Indian life and culture. Buddhism wrought revolutionary transformation in the life and culture of the peoples of South-East Asia and China. Christianity and Islam spread among the peoples of Asia and Europe kindling latent fires and opening fresh chapters in the history of the world.

The religions of the world may be grouped into three broad classes. 1. Leading religions, 2. Lesser religions and 3. Primitive religions. The leading religions are Buddhism, Christianity, Confucianism, Hinduism and Islam. The lesser religions include Jainism and Sikhism of India, Judaism of Palestine, Shintoism of Japan, Taoism of China and Zoroastrianism originally of Persia. The primitive religions count by the thousand. They are all very small communities, with a handful of votaries each. They are principally found among the aboriginal tribes of Australia, the Americas, India, Burma, South East Asia, Indonesia and Africa.

Buddhism. Buddhism was founded by Gautama Buddha who lived in the 6th century B.C.† Gautama, otherwise known as Siddhartha, was the son of an Indian prince, Suddhodana, chief of the Sakyas. Even as a child he was given to contemplation. The sorrows and sufferings of the world tormented his loving heart and he abandoned his princely home, his wife and child and started in pursuit of enlightenment at the age of 29. After years of wandering and contemplation Gautama at last found

enlightenment while meditating under a great peepul tree. From that day, he came to be known as the *Buddha* or the Enlightened One.

The Buddha preached that emancipation from the cycle of rebirths, i.e., *Nirvana*, can be attained by a path of self-purification. He attached little importance to rituals and ceremonies in which the Brahmin priests indulged. He does not appear to have even envisaged the existence of a Supreme God. He preached in the vernacular of the people, a simple doctrine of love and mercy which appealed to all.

Buddhism is essentially a religion of kindness, humanity and equality. It denounces all claims to superiority on grounds of birth or caste. The eminence or lowness of men is determined by their own conduct and actions.

Two or three centuries after the death of the Buddha, we find the Buddhist religion divided into two broad schools, the *Hinayana* and the *Mahayana*. The Hinayana school prided itself on maintaining the teachings of the Buddha in their original form. The Mahayana school converted the human Buddha—*Sakya muni*—into an eternal and supreme deity, presiding over the world and succouring his devotees.

Mahayana Buddhism is prevalent in China, Tibet, Korea and Mongolia. Hinayana Buddhism is prevalent in Burma, Sri Lanka, Kampuchea and Vietnam.

The most sacred places of Buddhism are Lumbini in Nepal, where the Buddha was born, the Bodhi Gaya (Bihar), where he

† The actual dates of Buddha's birth and death are disputed.

received enlightenment and Kusunagara (UP), where he attained *nirvana*.

Christianity founded by Jesus Christ now commands the largest following in the world. Christ was born in B.C. 4 in Judea.★ He started preaching about the Kingdom of God when he was thirty. His activities roused the opposition of the Jewish highpriests who accused him of blasphemy.

He was crucified under the orders of Pontius Pilate, the Roman Governor. After three days, Christ was resurrected from the dead. With the Resurrection of Christ, his disciples took heart and went about preaching the kingdom of God to all the peoples of the world.

Christianity spread throughout the Roman Empire where it was made the state religion in the 4th century A.D. Later, the Church split into two broad groups—the Western Church under the Pope in Rome, and the Eastern Churches under the Patriarchates of Antioch, Alexandria and Constantinople. Still later, further disruptions took place. The Roman Church was broken up by Protestantism, while in the Eastern Churches, many communities like the Armenians, Ethiopians, Russians and Indians set up their own Patriarchates.

Jerusalem, where Christ lived and preached, is the most sacred place of Christians all over the world.

Confucianism. Kung Fu Tsu, better known as Confucius, was born in 551 B.C. in China. Even as a young man, he had an ardent thirst for knowledge. When still in his youth, he met and talked with Lao-tse who was then a famous figure. Struggling through poverty, Confucius first became a minor civil servant and later rose to be the magistrate of a state. His brilliant administration evoked the jealousy of others, who conspired to bring about his dismissal in 496 B.C. Thereafter he wandered about penniless and homeless, until in 478 B.C. he died, aged seventythree.

After his death, his sayings were collected in the *Analects* and he was honoured throughout China, as a deity ranking with the deities of Heaven and Earth. Confucius was a

moralist rather than the founder of a religion. He conserved, systematised and taught the age-old teachings in China. He advocated regularity in life, temperance in food and drink and emphasised the importance of learning, loyalty and truthfulness. He formulated a golden rule of reciprocity, "what you do not want done to yourself, do not to others"—just a step short of the Lao-tsean and Christian doctrine of returning good for evil.

Peking is the city sacred to the adherents of both Taoism and Confucianism.

Hinduism. The word *Hindu* originally was the Persian rendering of the Indian word *Sindhu*—the Sanskrit name of the river Indus. The Persian name *Hindu* must have come into being in the 6th century B.C. when the territory round Indus formed part of the Persian Empire. But the name disappeared from India, with the exit of the Persians. It came back to India, centuries later, with the Muslim invasions from the north-west.

At that time, however, the word *Hindu* simply meant *Indian* and had no religious connotation. Subsequently, under the Mughal emperors, the word assumed a religious tint and under the British it came to be applied exclusively to the people, who followed the age-old religion of India.

The basis of Hinduism lies in the four *Vedas* of the Aryans. The word *veda* is derived from *vid*, to know. The vedas are known as *sruti*, or that which is heard or revealed. The orthodox Hindus think that the vedas are *anadi*, without a beginning. Others believe that the vedas were revealed to ancient *rishis* (sages).

The *Rigveda* is the earliest and the most important of the four vedas. It is the oldest scripture in the world having been composed in the third millennium B.C. It consists of over 1000 hymns, a heterogeneous collection of prayers to gods like *Agni*, *Vayu*, *Varuna*, *Indra*, *Mitra*, *Soma*, *Ushas* and others, instructions on rituals, incantations, songs, and verses on nature. The other three vedas are more specialised. The *Yajur-Veda* deals mainly with sacrificial invocations, the *Sama Veda* contains melodic invocations and the *Atharva Veda* deals with medicines and magical incantations.

Each Veda is divided into *mantras* (hymns), *Brahmanas* which explain the

★ The date is disputed. See Chapter 'Outline of History in part one.

mantras and rituals, *Aranyakas*, mystic teachings meant for meditation in forests and *Upanishads*, speculations on Being and Reality.

Early Aryans. The early Aryan gods were deifications of natural forces, Agni, Varuna, Soma, Surya etc. They were worshipped with sacrifice. There were no temples or images. The sacrifices were performed on open altars, where a wood fire was lighted, and offerings of food and drink, in the shape of meat, fat, butter, milk, cakes of barley and the spirituous drink *soma*, were offered to the gods, who were supposed to dwell in the sky. This was the vedic rite of *homa*, the quintessence of vedic religion.

When the Aryans came to India, they encountered a highly civilised people—the Dravidians—the builders of the City Civilization of the Indus Valley. They defeated the Dravidians and probably enslaved them. But though superior in war, the Aryans were far behind the Dravidians in culture. Before long they succumbed to the superior culture the pre-Aryans and adopted it for their own. *Graecia capta ferum victorem cepit** (Enslaved Greece made a slave of her rough conqueror).

The mainstay of popular Hinduism is the later vedic literature which consists of the *puranas* (old stories) and *itihasas* (epics). There are 18 puranas: *Matsya*, *Markandeya*, *Bhagavata*, *Bhavishya*, *Brahma*, *Brahmanda*, *Brahmavaivarta*, *Vayu*, *Vishnu*, *Varaha*, *Vamana*, *Agni*, *Naradiya*, *Padma*, *Linga*, *Garuda*, *Kurma*, and *Skanda*. There are also a number of *upa puranas* or minor puranas. Some puranas are believed to date back to the pre-Christian era. But many are believed to have been written between the third and the seventh centuries A.D.

The Epics. The *Itihasas* or epics are two—the *Ramayana* by Valmiki and the *Mahabharata* by Vyasa. Both these great works drew their inspiration from pre-Aryan folk-lore. The story of Rama or *Ramayana* looks like a blend of three distinct stories of pre-Aryan origin, put together at different times and finally embellished as a national poem of epic dimensions. The *Mahabharata*, on the other hand, embodies the legends of

the Aryans and the non-Aryans and was created consciously as the national poem of a new Hindu nation of mixed origin welded into one people under Brahmana guidance.-

The popular gods of the early Aryans, Indra, Varuna, Agni, Soma, Surya and others yielded place in course of time to a group of more powerful and more personal gods, more profound and cosmic and more philosophical in conception—namely the puranic gods of Hinduism headed by *Siva-Uma* and *Sri-Vishnu*. *Siva* and *Uma* are clearly pre-Aryan gods. *Vishnu* was partly Aryan—a form of Sun god and partly Dravidian—the blue sky-god. *Sri* was an Aryan goddess to start with, the Indian counterpart of the European *Ceres*, but in her association with Vishnu as *Gajalakshmi*, she is indigenous and pre-Aryan.

The outstanding instance of the Dravidisation of the Aryan religion is found in the preponderant place given to the *puja* form of worship compared to Aryan *homa*. Puja rite, which involves the offering of flowers, fruits, leaves, water etc. to an image or symbol of divinity, is characteristically Dravidian. This is now the everyday form of worship for all Hindus—the *homa* being kept up artificially among limited groups of Brahmins or Kshatriyas.

Bhagavad Gita. The imprimatur or theological sanction for puja is found in the Bhagavad Gita** which is the bedrock of modern Hinduism.

"If any offers me with devotion, a leaf, a flower, a fruit or water, I receive that offered in devotion by the person whose soul is disciplined". Gita IX, 26.

Hinduism emerged as the national religion by a brilliant synthesis of Aryan and non-Aryan ideas. This ability to adopt or adjust alien ideas has made Hinduism a highly receptive and tolerant religion. It is this receptivity that has helped it to survive the onslaughts of other religions and influences through centuries.

When Buddhism rose as a challenge to orthodox Hinduism, Hinduism reacted by sanctifying the Buddha as an *avatar* of Vishnu. Similarly, the Jain idea of non-violence or non-injury to living things appealed to many

* S.K. Chatterjee—*Vedic Age*, Bharat Vidya Bhavan.

** Bhagavad Gita occurs in the Mahabharata.

people as a gospel of mercy, good will and fellowship with all living creatures. Hinduism took over the idea and worked it out as the doctrine of *Ahimsa*, which was elevated as the highest of all *dharmas*.

In spite of its great adaptability and accommodation, Hinduism has been rocked by dissensions and disputations. The bitter struggle between *Vaishnavites* and *Saivaites*, between supporters of the God Siva, lasted for a long time. But this was rather a struggle for supremacy in the Hindu fold—never a segregation from it.

Like all old religions, the appeal of Hinduism has flagged and waned from time to time. And from time to time, reformers have sprung up, brilliant intellects and devout ascetics like Sankaracharya (8th century A.D.), Ramanuja (12th century) and Madhwa (13th century)—who have not merely restored popular faith but also countered heretical or fissiparous tendencies, by a re-interpretation of Hindu philosophy and reformation of Hindu practices, to meet the demands of the times.

Sankaracharya. Modern Hinduism may be dated from the days of *Sri Sankaracharya*, more than 1000 years ago. Sankara lived in the 8th century A.D. He was born at Kaladi in Kerala of a Namboodiri Brahmin family. He is by far the greatest of Hindu reformers. Before he died at the early age of 32, he travelled through India thrice, debating with scholars and expounding his theory of *Advaita* or monism. He was not only a great thinker but also a great organiser.

Among the most durable monuments to his organising zeal are the famous monasteries of Sringeri in Karnataka, Dwaraka in Gujarat, Puri in Orissa and Badrinath on the snowy heights of the Himalayas. He purged Hinduism of many evil cults and practices. Thus, the worship of the Mother Goddess, who was called by many names—*Devi*, *Durga*, *Kali*, *Lakshmi*, *Parvati*, *Amba*, *Amman*, etc—had degenerated into licentiousness.

Devi worship, in the past was part of the *Sakta* cult with its five Makaras, *matsya* (fish), *mamsa* (meat), *madya* (liquor), *mudra* (dance), and *maithuna* (copulation). Sankara reformed this cult and restored it to its original purity. Similarly he is said to have put down the *Kapalikas*, who indulged in human

sacrifices to appease God Bhairava. Sankara thus rejuvenated Hinduism and gave it a new philosophy and a new look.

Ramanuja, the next great reformer lived in the 12th century A.D. He was born in Sriperumbadur in Tamil Nadu. He modified Sankara's philosophy of *Advaita* and preached a new philosophy *Visishtadvaita* or qualified monism. Ramanuja laid great emphasis on *bhaktimarga* or deliverance by way of devotion to a compassionate god, in contrast to *Karmamarga* or the way of deliverance by the performance of vedic rites.

Madhwa, born in 1238, near Udipi in Karnataka is the third of the great reformers. He is the supreme exponent of *dvaita* or dualism. All these great reformers stressed the importance of *bhakti* or devotion to a personal god.

The renovation of Hinduism started by this great trio of the south, was continued by a number of saints and sages in the rest of India, Ramananda of Allahabad, Vallabhacharya of Benares, Namadeva of Maharashtra. (who unlike others came from a low caste), Mirabai of Rajasthan (a princess turned *sanyasin*), Ekanath, Tukaram and Ramdas, all from Maharashtra, Surdas, the blind poet of Agra, Lalla of Kashmir and others.

The greatest of the *bhakti* leaders and one of the greatest reformers of Hindu religion is Chaitanya (1485-1533), who hailed from a Brahmin family in Bengal. At the age of 24 he became a *sanyasin* and spent the rest of his life, preaching the *bhakti* movement all over North India.

Revitalisation. Organised work for the re-vitalisation of Hinduism started with Swami Dayananda Saraswati (1824-1883). He founded the *Arya Samaj* and started the *Sudhi* (purification) movement, for the conversion of non-Hindus to Hinduism. He was a great Sanskrit scholar and admonished his followers to go back to the Vedas.

The next great reformer, in point of time, was *Ramakrishna Paramahansa* (1836-1886). He was a poor priest in a temple of Calcutta, without any formal education, eastern or western. But he was a deeply religious man, who believed in the inherent truth of all religions. His catholicity, mysticism and spiritual fervour attracted a small band of de-

voted disciples. They formed a Mission, named after him, the Ramakrishna Mission.

The most famous leader of the Mission was Narendranath Datta, an English educated disciple of Paramahansa. In later years, he became famous as *Swami Vivekananda* and carried the message of Hinduism to far off countries like USA. The Ramakrishna Mission stands for social and religious reform, based on the ancient culture of India.

ISLAM. In Arabic, Islam means submission, obedience or peace. It is meant as the obedience and submission to God to attain peace in the world. The believers of this universal religion are called Muslims. They believe in one and only God, His Angels, His Books as completed by the Quran, as the word of God revealed to Prophet Muhammad through Angel Garbiel, His Messengers, with Muhammad being the last of them all.

Some call Islam *Mohammedanism* and address believers as *Mohammedans*. Muslims reject this as the misnomer will imply that the religion was founded by Muhammad, a mortal being. They believe that Muhammad was commissioned as prophet by God to teach the word of God.

The Muslims have to bear witness to the one-ness of God and the messengership of Muhammad; have to observe prayers five times daily with a weekly Juma prayer on Friday noons; have to pay a religious tax of 'Zakath' to the rightful beneficiaries, the minimum of which is two and a half per cent of the annual net income or of the total value of stock in business after discounting expenses and credits; have to keep the dawn-to-dusk fast, without food, drinks and smoking, in the ninth month of Ramzan of the Islamic Year. They have to make a pilgrimage to the annual congregation called *Haj* to Makkah (Mecca) in Saudi Arabia in the second week of the 12th month of Dul Haj. This pilgrimage once in a lifetime, to Kabah in Makkah is obligatory to the Muslims, male or female, who are financially, physically and mentally fit.

Every Muslim turns his face five times daily towards Kabah, the small cubical mosque in Makkah. They believe that it was the first mosque to be dedicated to the pure worship of the one and only God.

The Muslim Era began with the emigration of Muhammad from Makkah to Madina in 622 A.D. The Islamic Calendar is lunar, determined by the sight of the Moon. It is of 12 months, and each month is either thirty or twenty-nine days, depending upon the position of the Moon.

The two main festivals of the Muslims are *Idul Fiter* and *Idul Azha* publicised as 'Ramazan'. *Idul Fiter* is the feast of breaking the fast of Ramazan on the first day of the tenth month of Shavval. *Idul Azha* is the festival of sacrifice, mentioned otherwise as '*Bakrid*' in Calendars. This falls after two months of Ramazan, on the tenth day of the last month of Dul Haj, a day after the holy congregatic. 'Haj at Makkah. Prophet's day or Miladunnavi (the birthday of Prophet Muhammad) and Muharram (the day of sacrifice of Imam Husain, grandson of Muhammad) are also celebrated by Muslims.

Islam had its influence in the three continents of Asia, Africa and Europe. It gave right of property to women 12 centuries before England had adopted it in theory.

As per 1981 statistics, there are fifty-seven crores (570 million) Muslims in the world. Indonesia with 14 crores (140 millions) tops the list. India has nine crores of Muslims with Bangladesh 7.6, Pakistan 7.5, Nigeria 6.2, Russia 6, and China 5 crores.

Jainism derives its name from Jaina (the conqueror), the surname of Vardhamana Mahavira. Mahavira, like Buddha belonged to a princely family in Vaisali. At the age of 30, Mahavira renounced the world and spent 12 years in austerity and meditation in search of truth. At last, at the age of 42, while meditating under an Asoka tree, he received enlightenment. He was thereafter known as Jaina, the Conqueror.

According to Jain legends, Mahavira was born in the beginning of the sixth century B.C.* The actual dates of his birth and death are hotly disputed.

Jainism preaches that by following the threefold path, all souls will be released from the cycle of births and deaths and will reach the pure and blissful abode above (Sidha

* "The 2500th Nirvana Anniversary of Mahavira was celebrated as a national festival for one year commencing on 13th November, 1974"

Sala). The threefold path consists of three jewels (triratna), right belief, right cognition and right conduct.

After A.D. 82 Janinism split into two groups, the Digambaras and the Svetambaras. The Digambaras wore no clothes, while the Svetambaras wore white clothes. Both groups believed in overcoming the senses by meditation and penance.

The Jains have many places of pilgrimage in India. The most important of them are the mountain of Samata, near Parsanath in Bihar, where Parsua is said to have attained nirvana; Papapuri or Pavapuri where Mahavira died; Mount Abu in Rajasthan and Shravenbelgol in Karnataka, where the temples of Tirthankara, Parsua and Neminath are situated, and the high monolithic statue of Gomateshwar, son of Rishala, stands.

Judaism. Judaism, the religion of the Hebrews was in existence long before its first prophet and lawgiver Moses came on the scene. The first historical figure among the Hebrews is Abraham, who left Ur in Chaldaeia with the Hebrew tribe, about 2000 B.C. After a long period of wandering in the Arabian desert, the Hebrews at last settled in Egypt. However, they were enslaved by the mighty Pharaohs.

It was left to Moses to liberate the Hebrews from Egyptian bondage and to lead them to a land of milk and honey promised them by God. On the way, at Mount Sinai, Moses received the 'Ten Commandments' from 'Yahweh' or Jehovah, the Supreme God. By the time the Hebrews had settled in the Promised Land, the first five books of Moses had been written.

The Hebrews organised themselves into the Kingdom of Israel round about 1000 B.C. In 586 B.C. Nebuchadnezzar conquered Israel and carried off the Hebrews into the Babylonian Captivity. With the conquest of Palestine by Cyrus, the Hebrews were resettled in Israel. It was during this period that the writings of the Prophets and the Psalms were codified.

The Law, the Prophets and the Psalms remained as separate holy books until the time of Christ, when they were put together as the Hebrew Bible or the Old Testament. The Talmud, which is a collection of detailed laws for the guidance of civil, domestic and

Religious Membership

Total Christian	:	1,056,632,845
Roman Catholic	:	621,639,320
Eastern Orthodox	:	65,645,210
Protestant	:	369,408,315
Jewish	:	17,320,140
Muslim	:	555,277,180
Zoroastrian	:	245,620
Shinto	:	33,050,000
Taoist	:	20,563,475
Confucian	:	163,130,115
Buddhist	:	250,951,580
Hindu	:	462,589,910
Total Membership	:	2,559,820,000
Total population	:	4,721,886,000

(Source: Britannica Book of the Year, 1984)

social life, was completed during the 4th and 5th centuries A.D.

Judaism is a simple religion which aims at a moral life. To the Jews, right conduct is more important than right belief. According to the Talmud every good man is assured of heaven, the gentile who observes the moral law being the equal of the High Priest. Judaism is free from sentimentalism and is averse to self-imposed suffering, idleness and asceticism. Jerusalem is the Holy City of the Jews.

Shintoism. Shinto is a Japanese ethnic religion. The word "Shinto" means "the way of the spirits", the underlying principle being ancestor worship. It must have evolved gradually, accumulating fresh material as ages passed without any religious reformer directing it or altering it. It has no sacred books or moral code.

Shint is the religion of the followers of Mikado, the Japanese Emperor.

The Mikado is, in fact, the focal point of the religion, the only God that it knows. There are, however, innumerable deities. Except for certain rituals developed through the ages, Shinto has no religious content or appeal.

Shinto declined rapidly after the Japanese emperor surrendered his claim to divinity in 1947.

The central shrine of Shintoism is at Ise, in Central Japan, to which all devout Japanese make pilgrimages. Shintos are found almost exclusively in Japan.

Sikhism. The Sikh religion was founded by Guru Nanak who lived in the Punjab between A.D. 1469 and 1538. He was very much troubled at the frequent quarrels between Hindus and Muslims. He preached that there was only one God for Hindus and Muslims; and tried to work out a synthesis of the two religions. His mission became popular and he very soon had a large following. He travelled extensively, going as far as Makkah and was in frequent contact with the leading sages of Hindu and Muslim religions. On his death, he was succeeded by his disciples who became Gurus in their turn.

The Gurus have built up the modern Sikh community. The fifth guru, Guru Arjan Mahal (1581-1606) compiled the *Adi Granth*, the first sacred book of the Sikhs. The most famous Guru is Guru Govind Singh (d.1708). He organised the Sikhs into a militant community. He instituted *Pahul* or baptism in water stirred by a dagger.

Those who were baptised were known as the *Khalsa* (pure) with the designation *Singh* (lion). All members of the Khalsa had to wear the 5 k's—*Kes* (long hair), *Kangha* (comb), *Kripan* (sword), *Kachcha* (short drawers) and *Kara* (steel bracelet). The Khalsa soon emerged as a valorous fighting unit. It enabled the Sikhs to form a state of their own under Maharaj Ranjit Singh.

The growth of the British power in India reduced the Sikhs to submission. But they continued to be fighters and soon came to be described as the fighting arm of the British. The majority of the Sikh population is found in the Punjab and the city of Delhi. Their most important sacred place is the Golden Temple at Amritsar.

Taoism. Lao-tse, the founder of Taoism, was born in China about the sixth century B.C. Lao-tse put down his teachings in a book

called *Tao-Teh-King*, which became the Taoist Bible. "Tao" originally meant "road" or way, but later came to signify the perfect reality. Taoism preached goodness, simplicity, purity and gentleness in everyday life. "The three jewels of Taoism are compassion, moderation and humility. Lao-tse taught what Christ later preached, the return of good for evil. "When you are reviled, cherish no resentment, be kind and generous without seeking any return".

Lao-tse's philosophy, highbrow as it was, failed to evoke response in the common man. The disciples of Lao-tse used "Tao-Teh-King" as a source book for magic and Taoism degenerated into mere ritual. By the middle of the second century B.C. Taoism had debased itself so far as to deify Lao-tse, who was worshipped with sacrifice.

Zoroastrianism. Zarathushtra or Zoroaster, the founder of Zoroastrianism, was born in Medea (modern Iran) about 660 B.C. He thought that life was a struggle between the forces of good and evil. The spirit of good was Ahura Mazda with its helper *mithras*, the Light. The evil spirit was *Angra Mainyu* or *Ahriman*, the Lie Demon. Man could not be neutral in the struggle. He had to fight for right and live a righteous life. Those who lived righteously went to paradise which was a state of immortal holiness in thought, word and deed. The impious were condemned to an eternal hell of evil thoughts and deeds and physical torment. By 500 B.C. Zoroastrianism had become the leading faith in Persia and Medea.

The sayings of Zoroaster were gathered into a book, called *Avesta* or *Zend Avesta*, which became the Bible of the Persians.

The Zoroastrians who fled to India during the 8th century, were the ancestors of the present Parsi community in India.

67. CLASSICAL WRITERS

'The Classics' originally meant literature or art of ancient Greece and Rome. With the passage of time it acquired the broader sense of any literary or artistic work of the highest order, enduring interests, quality or style.

The following is a list of classical writers of Sanskrit, Greek and Latin with their important works, in the alphabetical order.

Aeschylus (526–456 B.C.) Athenian dramatist. *Prometheus Bound*, *The Persians*, *The Seven against Thebes*, *Oresteia*, etc.

Aesop (c. 620–560 BC) Greek fabulist. *Aesop's Fables*.

Amaruka (7th century AD) Sanskrit poet. *Amaruka Sataka* (100 stanzas of Amaruka).

Anacreon (c. 6th century B.C.) Famous Greek lyric poet.

Aquinas, St. Thomas (c. 1225–1274) Italian philosopher and theologian. *Summa Theologica*, *Summa Contra Gentiles*.

Aristophanes (c. 444–c. 385 B.C.) Athenian satirist and comic poet. *Lysistrata*, *Birds*, *Peace*, *Acharnians* etc.

Aristotle (384–322 B.C.) Greek Philosopher. *Rhetorics*, *Politics*, *Natural History*, *Poetics*.

Asvaghosha (A.D. 1st cent.) Sanskrit poet. *Buddhacharita* (Story of Buddha).

Bana (A.D. 7th cent.) Sanskrit prose writer. *Harshacharita* (Story of Harsha), *Kadambari*, a romantic story.

Bhadrabahu (4th cent. B.C.) *Kalpasutra* (a manual on ceremonies).

Bharavi (A.D. 6th cent.) Sanskrit poet. *Kiratharjuneeya* (Arjuna and Kiratha).

Bhatti (A.D. 7th cent.) Sanskrit poet. *Bhattikavya* (Bhatti's poem), a story of Rama. (100 Stanzas on morals).

Bhartruhari (A.D. 7th cent.) Sanskrit poet. *Nitishataka* *Shrinyaran Shataka* (100 stanzas on love), *Bhaktishataka* (100 stanzas on piety).

Bhasa (A.D. 5th cent.) A prolific Sanskrit writer. Wrote 13 plays. *Swapna Vasavadatta* (Vasavadatta's Vision), *Pratijna Yaugandharayana* (Vow of Yaugandharaya), *Charudatta*.

Bhavabhuti (A.D. 8th cent.) Sanskrit dramatist. *Malathimadhava* (story of Malathi and Madhava). *Mahaviracharita* (Story of the Great Hero), *Uttararamacharita* (Later deeds of Rama).

Bilhana (A.D. 12th cent.) Sanskrit poet. *Vikramankadevacharita* (Story of Vikramanka—Chalukyan emperor), *Chaurapan-chasika* (Fifty stanzas on the thief).

Dandin (7th cent. A.D.) Sanskrit prose writer. *Dasakumara Charita* (Tales of the Ten Princes).

Diogenes (412–323 B.C.) Greek philosopher, founder of Cynic philosophy.

Epicurus (342–270 B.C.) Greek philosopher, founder of the Epicurean School.

* Epicurean, today, means one who has fine tastes in eating and drinking. This is unfortunate, for Epicurus was a confirmed ascetic, who advocated intellectual pleasures and not the appeasement of physical appetites.

Letters to Herodotus, Menoecus and others, De rerum natura.

Euripides (480–406 B.C.) Greek dramatist. *Alcestis*, *Bacchae*.

Gunadhya (1st cent. A.D.) Sanskrit writer. *Brahm Katha* (the great story), a collection of many stories.

Hala (Satavahana King) (1st cent. A.D.) Sanskrit poet. *Saptasati* (Seven Hundred Verses).

Herodotus (c. 485–425 B.C.) Greek historian. *History of the Persian Invasion of Greece*.

Homer (c. 700 B.C.) Greek epic poet. *Illiad*, *Odyssey*.

Horace (65–8 B.C.) Latin poet. *Satires*, *Epodes*, *Odes*.

Jayadeva (12th cent. A.D.) Sanskrit poet. *Gita Govinda* (Song of Govinda).

Jimutavahana (12th cent. A.D.) *Dayabhaga*, a treatise relating to Hindu inheritance—part of a great compilation, *Dharma Sutra*.

Juvenal (Decimus Junius Juvenalis) (60–140), Latin poet. *Satires*.

Kalhana (12th cent. A.D.) Sanskrit writer. *Rajatarangini* (River of Kings—a story of the kings of Kashmir).

Kalidasa (5th cent. A.D.) The greatest Sanskrit poet. Plays: *Malavikagnimitra* (Malavika and Agnimitra—a comedy of harem intrigue), *Vikramorvasiyam* (Urvashi won by valour), *Abhijnana Sakunthalam* (Recognition of Sakunthala). Epics: *Raghu Vamsa* (Dynasty of Raghu), *Kumara Sambhavaom* (Birth of the War god). Lyrics: *Meghdoot* (Cloud Messenger), *Ritu Samhara* (Garland of Seasons).

Kautilya (Chanakya) (4th cent. B.C.) was the Chief Minister of Chandragupta Maurya. A well-seasoned politician, he practised Machiavellian tactics many centuries before Machiavelli. The only work attributed to him is *Artha Sastra* (Science of Statecraft).

Kumaradasa (6th cent. A.D.) Sanskrit poet. *Janakiharana* (Abduction of Janaki).

Magha (7th cent. A.D.) Sanskrit poet. *Sisupala Vadhom* (Slaying of Sisupala).

Mahendra Vikraman (a Pallava King) Sanskrit poet. *Matta Vilasa* (Sport of Drunkard).

Manu (2000 B.C.) (legendary author) Sanskrit law-giver. *Manu Smriti* (The Code of Manu).

Narayana (12th cent. A.D.) Sanskrit story teller. *Hitopadesa* (Salutary Advice)—selected stories from *Panchathanthra*.

Naya Chandra Suri (14th cent.) Sanskrit poet. *Hammira Mahakavya* (Epic of Ham-mira).

Ovid (**Publius Ovidius Naso**) (43 B.C. – 16 A.D.) Latin poet. *Tristia*, *Amores*, *Persephone Rapt*.

Panini (4th cent. B.C.) Sanskrit grammarian. *Ashtadhyayi* (Book of Eight Chapters).

Patanjali (2nd cent. B.C.) Sanskrit grammarian. *Mahabhashyam* (Commentary on Panini).

Plato (427–347 B.C.) Greek philosopher. *The Republic*, *Apology of Socrates*, *Phaedo*, *Laws*.

Pliny the Elder (23–79 A.D.) Latin philosopher. His *Natural History* is an encyclopaedia of all scientific knowledge available at the time.

Plutarch (c. A.D. 46–120) Latin biographer, *Lives*.

Rajasekhara (10th cent. A.D.) *Karpooora Manjari*, a romantic drama.

Sandhyakara (12th cent. A.D.) Sanskrit poet. *Rama Charitha* (Story of Rama).

Sappho of Lesbos (early 6th cent. B.C.) Greek poetess of romance and amour. *Unrequited Love*.

Seneca, Lucius Annaeus (c. B.C. – 56 A.D.). Stoic philosopher, tutor of Nero. Sentenced to end his own life, he killed himself courageously.

Somadeva (11th cent. A.D.) Sanskrit poet. *Katha Sarit Sagara* (Ocean of Story)—collection of stories.

Sophocles (495–406 B.C.) Greek dramatist. *Antigone*, *Oedipus the King*, *Oedipus at Colonus*.

Subandhu (7th cent. A.D.) Sanskrit poet.

Vasavadatta.

Sudraka (5th cent. A.D.) Sanskrit dramatist. *Mrichhakatika* (Clay cart).

Tacitus, Caius Cornelius (55 c. – 120) Latin historian. *Germania*, *Annals*, *Histories*.

Thucydides (c. 460–399 B.C.) Greek historian of the *Peloponnesian War*.

Vakpati (8th cent. A.D.) Sanskrit poet. *Ganda Vadha* (Slaying of Ganda) describes the exploits of Yasovarman, King of Kanyakubja.

Valmiki (6th cent. B.C.) Sanskrit epic poet. *Ramayana*.

Vatsyayana (5th cent. A.D.) Sanskrit writer. *Kama Sutra* (Art of Sex).

Vidyapati (Legendary author) Sanskrit prose writer. *Pancha Tantra* (Five Treatises)—a collection of tales.

Vijneswara (11th cent. A.D.) Sanskrit writer. *Mitakshara*, a treatise on the law of Hindu inheritance.

Virgil (**Publius Vergilius Maro**) (70–19 B.C.) Latin epic poet. *Aeneid*, *Georgics*.

Visakhadatta (6th cent. A.D.) Sanskrit dramatist. *Mudra Rakshasa* (Minister's Signet Ring), *Devi Chandragupta* (The Queen and Chandragupta)—political dramas.

Vyasa, (6th cent. B.C.) Sanskrit epic poet. *Mahabharata*, considered the longest epic in the world. It has nearly 100,000 stanzas.

Xenophon (444–359 B.C.) Greek soldier, historian and author. *Anabasis* (The Retreat of the Ten Thousand).

Zeno of Citium (c. 340–264 B.C.) Greek philosopher, founder of the Stoic school. Zeno taught in *Stoa Poikile* of Athens, hence *Stoic*.

68. CLASSICS: OLD & NEW

Neo-Classicism is the movement for a revival or adaptation of Classical style in literature, art, etc. However, those works of art or literature with qualities that transcend time can also be termed classics. Thus some of the modern literary or artistic pieces become classics of the first order.

The following is a list of some notable works and their authors:

- A China Passage: *John Kenneth Galbraith*
- A Critique of Pure Reason: *Immanuel Kant*
- A Dangerous Place: *Daniel Patrick Moynihan*
- A Doll's House: *Ibsen*
- Adonis: *P.B. Shelley*
- A Farewell to Arms: *Ernest Hemingway*

- A Guide for the Perplexed: *E.F. Schumacher*
- A Judge's Miscellany: *M. Hidayatullah*
- A Midsummer Night's Dream: *William Shakespeare*
- A Passage to England: *Nirad C. Chaudhury*
- A Passage to India: *E.M. Forster*
- A Personal Adventure: *Theodore H. White*
- A Prisoner's Scrapbook: *L.K. Advani*

A Sense of Time: *H.S. Vatsyayan*
 A Spaniard in the Works: *John Lennon*
 A Tale of Two Cities: *Charles Dickens*
 A Thousand Days: *Arthur M. Schlesinger*
 A View from Delhi: *Chester Bowles*
 A Village by the Sea: *Anita Desai*
 A Voice for Freedom: *Nayantara Sahgal*
 A Week with Gandhi: *Louis Fisher*
 A Woman's Life: *Guy de Maupassant*
 Adam Bede: *George Eliot*
 Adhe Adhure: *Mohan Rakesh*
 Adventures of Tom Sawyer, Adventures of
 Huckleberry Finn: *Mark Twain (Samuel
 Langhorne Clemens)*
 Adventures of Sherlock Holmes: *Arthur
 Conan Doyle*
 Advice and Consent: *Allen Drury*
 Affluent Society: *John Kenneth Galbraith*
 Age of Reason: *Jean Paul Sartre*
 Agni Veena: *Kazi Nazrul Islam*
 Agony and the Ecstasy: *Irving Stone*
 Airport: *Arthur Hailey*
 Akbarnama: *Abul Fazal*
 Alice in Wonderland: *Lewis Carroll*
 All's Well that Ends Well: *William Shakespeare*
 All Quiet on the Western Front:
Erick Maria Remarque
 All the President's Men: *Carl Bernstein &
 Bob Woodward*
 All the Prime Minister's Men: *Janardan Thakur*
 All things Bright and Beautiful: *Herriot*
 Amar Kosh: *Amar Singh*
 An American Tragedy: *Theodore Dreiser*
 An Autobiography: *Jawaharlal Nehru*
 An Eye to China: *David Selbourne*
 An Idealist View of Life: *Dr. S. Radhakrishnan*
 An Unknown Indian: *Nirad C. Choudhury*
 Anandmath: *Bankim Chandra Chatterjee*
 And Quiet Flows the Don: *Mikhail Sholokhov*
 Androcles and the Lion: *George Bernard Shaw*
 Animal Farm: *George Orwell*
 Anna Karenina: *Leo Tolstoy*
 Answer to History: *Mohammad Reza Pahlavi*
 Antony and Cleopatra: *William Shakespeare*
 Ape and Essence: *Aldous Huxley*
 Apple Cart: *George Bernard Shaw*
 Area of Darkness: *V.S. Naipaul*
 Arms and the Man: *George Bernard Shaw*
 Around the World in Eighty Days: *Jules Verne*
 Arrangement, The: *Elia Kazan*
 Arrowsmith: *Sinclair Lewis*
 As You Like It: *William Shakespeare*
 Asia and Western Dominance: *K.M. Panicker*
 Asian Drama: *Gunnar Myrdal*
 August 1914: *Alexander Solzhenitsyn*
 Autobiography of an Unknown Indian:
Nirad C. Choudhury
 Autumn Leaves: *O. Pulla Reddi*
 Babbitt: *Sinclair Lewis*
 Back to Methuselah: *George Bernard Shaw*
 Bandicoot Run: *Manohar Malgonkar*

D.H. Lawrence Centenary

The birth centenary of D.H. Lawrence, one of the more original and most controversial English writers of the century, was celebrated in Britain in 1985.

David Herbert Lawrence was born on September 11, 1885, in the small home of a coal miner, in the pit village of Eastwood, Nottinghamshire, Britain. Best known for his 'Lady Chatterley's Lover', Lawrence was a journalist, traveller, painter, and novelist. The controversial novel, originally published in Italy in 1928 and in Paris the following year, in limited editions, unleashed so great a storm that its full text was published only in 1959 in New York and in 1960 in London—30 years after the author's death. It is only after the late 60's that a genuinely critical appraisal of 'Lady Chatterley's Lover' was made.

Lawrence is the author of more than 60 novels and short stories, 8 Plays and a host of paintings and thousands of published letters.

Bangladesh: The Unfinished Revolution:

Lawrence Lifschultz

Banyan Tree, The: *Hugh Tinker*

Beast and Man: *Murry Midgley*

Beginning of the Beginning: *Bhagwan Sri
Rajneesh*

Ben Hur: *Lewis Wallace*

Bermuda Triangle: *Berlioz*

Best and the Brightest, The: *David Halberstan*

Beyond Modernisation, Beyond Self: *Sisirkumar
Ghose*

Bharat Bharati: *Maithili Saran Gupta*

Big Fisherman, The: *Robert Louis Stevenson*

Biographia Literaria: *Samuel Taylor Coleridge*

Black Wednesday: *Promila Kalhan*

Blind Ambitions: *John Dean*

Blind Beauty: *Boris Pasternak*

Bliss was it in that Dawn: *Minoo Massani*

Bloodline: *Sidney Sheldon*

Born Free: *Joy Adamson*

Bread, Beauty and Revolution: *Khwaja Ahmad
Abbas*

Breakthrough: *Gen. Moshe Dayan*

Bride's Book of Beauty, The: *Mulk Raj Anand*

Brothers Karamazov: *Feodor Dostoyevsky*

Bubble, The: *Mulk Raj Anand*

Butterfield 8: *John O' Hara*

By Love Possessed: *James Gould Cozzens*

Caesar and Cleopatra: *George Bernard Shaw*

Cancer Ward: *Alexander Solzhenitsyn*

Candida: *George Bernard Shaw*

Candide: *Voltaire*

Canterbury Tales: *Geoffrey Chaucer*

Cardinal, The: *Henry Morton Robinson*

Centennial: *James A. Michener*

Chandalika: *Rabindra Nath Tagore*

Chemmeen: *Thakazhi Sivasankara Pillai*

Cherry Orchard: *Anton Chekov*

Chesapeake: *James A. Michener*

Chidambaram: *Sumitranandan Pant*

Child Harold: *Lord Byron*

China's Watergate: *Leo Goodstadt*

Chinese Betrayal: *B.N. Malik*

Chitra: *Rabindra Nath Tagore*

Chuthirappaavai: *P.V. Akilandam*

Choma's Drum: *K. Shivaram Karanth*

Chronicle of a Death Foretold: *Gabriel Garcia Marquez*

Climate of Treason: *Andrew Boyle*

Comedy of Errors: *William Shakespeare*

Common Sense: *Thomas Paine*

Communist Manifesto: *Karl Marx*

Confessions: *Jean Jacques Rousseau*

Confessions of a Lover: *Mulk Raj Anand*

Confessions of an Opium Eater, The: *Thomas Dequincey*

Confidential Clerk: *T.S. Eliot*

Conquest of Self: *Mahatma Gandhi*

Continent of Circe: *Nirad C Choudhury*

Coolie: *Mulk Raj Anand*

Count of Monte Cristo: *Alexander Dumas*

Coup, The: *John Updike*

Court Dancer, The: *Rabindra Nath Tagore*

Coverly Papers: *Joseph Addison*

Crescent Moon: *Rabindra Nath Tagore*

Crime and Punishment: *Feodor Dostoyevsky*

Crisis in India, The: *Ronald Segal*

Crisis into Chaos: *E.M.S. Namboodiripad*

Cry My Beloved Country: *Alan Paton*

Culture in the Vanity Bag: *Nirad C. Choudhury*

Curtain Raisers: *K. Natwar Singh*

Darkness at Noon: *Arthur Koestler*

Dark Room, The: *R.K. Narayan*

Das Kapital: *Karl Marx*

David Copperfield: *Charles Dickens*

Dean's December, The: *Saul Bellow*

Death of a City: *Amrita Pritam*

Death of a Patriot: *R.E. Harrington*

Death of a President: *William Manchester*

Debacle: *Emile Zola*

Decameron: *Giovanni Boccaccio*

Decline and Fall of the Roman Empire: *Edward Gibbon*

Decline and Fall of Indira Gandhi:

D. R. Mankekar & Kamala Mankekar

Democracy means Bread and Freedom:

Piloo Mody

Democracy Redeemed: *V.K. Narasimhan*

Descent of Man: *Charles Darwin*

Deserted Village: *Oliver Goldsmith*

Devdas: *Sharat Chandra Chatterjee*

Dilemma of Our Time: *Harold Joseph Laski*

Diplomacy in Peace and War: *T.N. Kaul*

Discovery of India: *Jawaharlal Nehru*

Distant Drums: *Manohar Malgonkar*

Divine Comedy: *Alighieri Dante*

Divine Life: *Swami Sivananda*

Doctor's Dilemma: *George Bernard Shaw*

Dr. Jekyll and Mr. Hyde: *Robert Louis Stevenson*

Dr. Zhivago: *Boris Pasternak*

Don Juan: *Lord Byron*

Don Quixote: *Miguel de Cervantes*

Durgesh Nandini: *Bankim Chandra Chatterjee*

Dynamics of Social Change: *Chandra Shekhar*

Earth: *Emile Zola*

Economic Planning of India: *Ashok Mehra*

Economics of the Third World: *S.K. Ray*

Education of Public Man, The: *Hubert Humphrey*

Elegy written in a Country Churchyard:

Thomas Gray

Emma: *Jane Austen*

Ends and Means: *Aldous Huxley*

Envoy to Nehru: *Escott Reid*

Essays for Poor to the Rich: *John Kenneth Galbraith*

Essays of Elia: *Charles Lamb*

Essays on Gita: *Sri Aurobindo Ghosh*

Eternal Himalayas: *Major H.P.S. Ahluwalia*

Executioner's Song: *Norman Mailer*

Expanding Universe: *Arthur Stanley Eddington*

Experiments with Untruth: *Michael Henderson*

Eye of the Storm, The: *Patrick White*

Face to Face: *Lasse & Mrs. Lisa Berg*

Faces of Everest: *Major H.P.S. Ahluwalia*

Family Reunion: *T.S. Eliot*

Far from the Madding Crowd: *Thomas Hardy*

Far Pavilions, The: *M.M. Kaye*

Faraway Music, The: *Svetlana Allilueva*

Farewell the Trumpets: *James Morris*

Farewell to Arms: *Ernest Hemingway*

Farm House: *George Orwell*

Father and Sons: *Ivan Turgenev*

Faust: *J.W. Von Goethe*

Fidelio: *L. Beethoven*

Fifth Horseman, The: *Larry Collins & Dominique Lapierre*

Final Days, The: *Bob Woodward & Carl Bernstein*

Finding a Voice—Asian Women in Britain: *Amrit Wilson*

Fire Next Time, The: *James Baldwin*

First Circle: *Alexander Solzhenitsyn*

Flames from the Ashes: *P.D. Tandon*

Flounder, The: *Gunter Grass*

Food, Nutrition and Poverty in India:

V.K.R.V. Rao

For Whom the Bell Tolls: *Ernest Hemingway*
 Forbidden Sea, The: *Tara Ali Baig*
 Forsyth Saga: *John Galsworthy*
 Fortynine Days: *Amrita Pritam*
 Freedom at Midnight: *Larry Collins & Dominique Lapierre*
 French Revolution: *Thomas Carlyle*
 Friends and Foes: *Sheikh Mujibur Rahman*
 From India to America: *S. Chandrasekhar*

Ganadevata: *Tara Shankar Bandpadhyaya*
 Gandhi and Stalin: *Louis Fisher*
 Gardener: *Rabindra Nath Tagore*
 Gathering Storm: *Winston Churchill*
 Ghasiram Kotwal: *Vijay Tendulkar*
 Gitanjali: *Rabindra Nath Tagore*
 Glimpses of World History: *Jawaharlal Nehru*
 Godan: *Prem Chand*
 Godfather, The: *Mario Puzo*
 Golden Threshold: *Sarojini Naidu*
 Gone with the Wind: *Margaret Mitchel*
 Good Earth: *Pearl S. Buck*
 Grammar of Politics: *Harold Joseph Laski*
 Grapes of Wrath: *John Steinbeck*
 Great challenge, The: *Luis Fischer*
 Great Expectations: *Charles Dickens*
 Great Gatsby: *F. Scott Fitzgerald*
 Great Tragedy: *Z.A. Bhutto*
 Guide: *R.K. Narayan*
 Gulag Archipelago: *Alexander Solzhenitsyn*
 Gulliver's Travels: *Jonathan Swift*

Hamlet: *William Shakespeare*
 Heat and Dust: *Ruth Prawer Jhabwala*
 Heir Apparent: *Dr. Karan Singh*
 Heroes and Hero Worship: *Thomas Carlyle*
 Himalayan Blunder: *Brigadier J.P. Dalvi*
 Hindu View of Life: *Dr. S. Radhakrishnan*
 Hinduism: *Nirad C. Choudhury*
 House Divided: *Pearl S. Buck*
 Human Factor: *Graham Greene*
 Humboldt's Gift, The: *Saul Bellow*
 Hunchback of Notre Dame: *Victor Hugo*
 Hungry Stones: *Rabindra Nath Tagore*

I follow the Mahatma: *K.M. Munshi*
 Idiot, The: *Feodor Dostoyevsky*
 Idols: *Sunil Gavaskar*
 If I am Assassinated: *Z.A. Bhutto*
 Importance of Being Earnest: *Oscar Wilde*
 In Evil Hour: *Gabriel Garcia Marques*
 In Memoriam: *Alfred Lord Tennyson*
 In Search of Gandhi: *Richard Attenborough*
 In Search of Identity: *Anwar el-Sadat*
 India, The Critical Years: *Kuldip Nayar*
 India Changes: *Taya Zinkin*
 India Discovered: *John Keay*
 India Divided: *Rajendra Prasad*
 India of Our Dreams: *M.V. Kamath*
 India Remembered: *Percival & Margaret Spear*
 India Wins Freedom: *Abdul Kalam Azad*
 Indian Philosophy: *Dr. S. Radhakrishnan*

Indo-Anglians

'Oxford Companion to English Literature' brought out its 5th edition, edited by *Margarat Drabble* in 1985. This valuable compendium lists a number of Indians who have made great contribution to the growth of English literature.

The list includes the following writers: *Kalidasa, Rabindra Nath Tagore, Iqbal, V.S. Naipaul, Mulk Raj Anand, G.V. Desani, Ved Mehta, Raja Rao, Ruth Prawar Jabwala, Kamala Markandeya, Salman Rushdie.*

Conspicuous by omission are: *Subramania Bharati, Khalib, J. Krishna Murthy, Prem Chand, Sri Arobindo, H.S. Vatsyayan, Santha Rama Rao, Nayantara Sahgal, Manohar Malgokar, Nira C. Choudury, Shiv Naipaul, Dom Moraes.*

V.S. Naipaul has a substantial entry, rather longer than that of *Nobokov*. And *Mulk Raj Anand*, absent from earlier edition, has earned a respectable place.

India's China War: *Neville Maxwell*
 India's Priceless Heritage: *N.A. Palkhivala*
 Indira Gandhi's Emergence and Style: *Nayantara Sehgal*
 Indira's India: *S. Nihal Sing*
 Inside Asia, Inside Europe, Inside Africa, etc.: *John Gunther*
 Intimacy: *Jean Paul Sartre*
 Invisible Man: *H.G. Wells*
 Isabella: *John Keats*
 Islamic Bomb: *Stev Weissman & Herbert Krousney*
 Island in the Streams: *Ernest Hemingway*
 Is Paris Burning?: *Larry Collins & Dominique Lapierre*
 Ivanhoe: *Sir Walter Scott*

Jane Eyre: *Charlotte Bronte*
 Jean Christopher: *Romain Rolland*
 Jobs for the Millions: *V.V. Giri*
 Julius Caesar: *William Shakespeare*
 Jungle Book: *Rudyard Kipling*

Kayar: *Thakazhi Sivasankara Pillai*
 Kagaz Te Kanwas: *Amrita Pritam*
 Kamayani: *Jai Shankar Prasad*
 Kamasutra: *S.H. Vatsyayan*

Kanthapura: *Raja Rao*
 Kapal Kundala: *Bankim Chandra Chatterjee*
 Kenilworth: *Sir Walter Scott*
 Kidnapped: *Robert Louis Stevenson*
 Kim: *Rudyard Kipling*
 King of Dark Chamber: *Rabindra Nath Tagore*
 King Lear: *William Shakespeare*
 Kissinger Years, The: *T.N. Kaul*
 Kore Kagaz: *Amrita Priyam*
 Kubla Khan: *Samuel Taylor Coleridge*

Lady Chatterley's Lover: *D.H. Lawrence*
 Last Days of Pompeii: *Edward George Lytton*
 Laws Versus Justice: *V.R. Krishna Iyer*
 Last Maharaja, The: *Jean Louis Nou & Jacques Pouchepadass*
 Last Things: *C.P. Snow*
 Lead Kindly Light: *Vincent Shean*
 Leaders: *Richard Nixon*
 Leaves of Grass: *Walt Whitman*
 Le Contract (Social Contract): *J.J. Rousseau*
 Les Miserables: *Victor Hugo*
 Letters From the Field: *Margarete Mea*
 Leviathan: *Thomas Hobbes*
 Life Divine: *Sri Aurobindo*
 Life of Dr. Johnson: *James Boswell*
 Lolita: *Vladimir Nabokov*
 Lost Honour: *John Dean*
 Love Story: *Eric Segal*

Macbeth: *William Shakespeare*
 Magic Mountain: *Thomas Mann*
 Main Street: *Sinclair Lewis*
 Major Barbara: *George Bernard Shaw*
 Making of a Midsummer Night's Dream, The: *David Selbourne*
 Man and Superman: *George Bernard Shaw*
 Man Eaters of Kumaon: *Jim Corbett*
 Man of Destiny: *George Bernard Shaw*
 Mankind and Mother Earth: *Arnold Toynbee*
 Many Worlds: *K.P.S. Menon*
 Marriage and Morals: *Bertrand Russel*
 Masters, The: *C.P. Snow*
 Maurice: *E.M. Forster*
 Mayor of Casterbridge: *Thomas Hardy*
 Mein Kampf: *Adolf Hitler*
 Memories of Hope: *Gen. Charles de Gaulle*
 Men Who Killed Gandhi, The: *Manohar Malgonkar*
 Merchant of Venice The: *William Shakespeare*
 Middle Ground, The: *Margaret Drabble*
 Middle March: *George Eliot*
 Midnight's Children: *Salman Rushdie*
 Mill on the Floss: *George Eliot*
 Miser, The: *Moliere*
 Moby Dick: *Hermann Melville*
 Moon and Six Pence: *W. Somerset Maugham*
 Moonlight Sonata: *L.B. Beethoven*
 Mother: *Maxim Gorky*
 Mother India: *Katherine Mayo*
 Mrs. Gandhi's Second Reign: *Arun Shourie*
 Much Ado About Nothing: *William Shakespeare*

Murder in the Cathedral: *T.S. Eliot*
 My Days: *R.K. Narayan*
 My Days with Nehru: *M.O. Mathai*
 My Experiments with Truth: *Mahatma Gandhi*
 My India: *S. Nihal Singh*
 My Life and Times: *V.V. Giri*
 My Own Boswell: *M. Hidayatullah*
 My Struggles: *E.K. Nayanar*
 My Truth: *Indira Gandhi*
 Naked Face, The: *Sydney Sheldon*
 Nana: *Emile Zola*
 New Dimensions of India's Foreign Policy: *Atal Behari Vajpayee*
 Nineteen Eighty Four: *George Orwell*
 Nisheeth: *Uma Shankar Joshi*

O' Jerusalem: *Larry Collins & Dominique Lapierre*
 Odakkuzhal: *G. Shankara Kurup*
 Of Human Bondage: *W. Somerset Maugham*
 Old Man and the Sea: *Ernest Hemingway*
 Oliver Twist: *Charles Dickens*
 Oliver's Story: *Eric Segal*
 One day in the Life of Ivan Denisovich: *Alexander Solzhenitsyn*
 One Hundred Years of Solitude: *Gabriel Garcia Marquez*
 One World: *Wendell Wilkie*
 One World and India: *Arnold Toynbee*
 One World to Share: *Shridhath Ramphal*
 Origin of Species: *Charles Darwin*
 Oru Desathinte Katha: *S.K. Pottekkatt*
 Othello: *William Shakespeare*
 Other Side of Midnight, The: *Sidney Sheldon*
 Our Films Their Films: *Satyajit Ray*

Painted Veil: *W. Somerset Maugham*
 Painter of Signs: *R.K. Narayan*
 Pakistan Cut to Size: *D.R. Mankekar*
 Pakistan, The Gathering Storm: *Benazir Bhutto*
 Panchatantra: *Vishnu Sharma*
 Paradise Lost: *John Milton*
 Pather Panchali: *Bibhuti Bhushan*
 Peter Pan: *J.M. Barrie*
 Pickwick Papers: *Charles Dickens*
 Pilgrim's Progress: *John Bunyan*
 Portrait of India: *Ved Mehta*
 Post Office: *Rabindra Nath Tagore*
 Power and Glory: *Graham Greene*
 Power That Be, The: *David Halberstan*
 Prathama Pratishruti: *Ashapurna Devi*
 Prelude: *William Wordsworth*
 Price of Power: *Kissinger in the Nixon White House: Seymour M. Hersh*
 Pride and Prejudice: *Jane Austen*
 Prince: *Niccolo Machiavelli*
 Prison Diary: *Jayaprakash Narayan*
 The Prisoner of Zenda: *Anthony Hope*
 Promises to Keep: *Chester Bowles*
 Prussian Nights: *Alexander Solzhenitsyn*
 Pygmalion: *George Bernard Shaw*

R Document, The: *Irving Wallace*
 Rage of Angels: *Sidney Sheldon*
 Ragtime: *E.L. Doctorow*
 Rain King, The: *Saul Bellow*
 Rangbhoomi: *Prem Chand*
 Rape of Bangladesh: *Anthony Mascarenhas*
 Rape of the Lock: *Alexander Pope*
 Rebel, The: *Albert Camus*
 Rebirth: *Leonid Brezhnev*
 Red Badge of Courage: *Stephan Crane*
 Red Star Over China: *Edgar Snow*
 Reflections on the French Revolution:
Edmund Burke
 Reminiscences of the Nehru Age: *M.O. Mathai*
 Return of the Native, The: *Thomas Hardy*
 Riding the Storm: *Harold MacMillan*
 Rights of Man: *Thomas Paine*
 Robe, The: *Lloyd C Douglas*
 Robinson Crusoe: *Daniel Defoe*
 Romeo and Juliet: *William Shakespeare*
 Rubaiyat-i Omar Khayyam: *Edward Fitzgerald*

Saket: *Maithili Sharan Gupta*
 Sanctuary: *William Faulkner*
 Scarlet Letter: *Nathaniel Hawthorne*
 Seven Lamps of Architecture: *John Ruskin*
 Seven Summers: *Mulk Raj Anand*
 Shadow from Ladakh: *Bhabani Bhattacharya*
 Shape of Things to Come: *H.G. Wells*
 She Stoops to Conquer: *Oliver Goldsmith*
 Ship of Fools: *Katherine Anne Porter*
 Shoes of the Fisherman, The: *Morris L. West*
 Six Characters in Search of an Author:
Lugi Pirandello

Small Land: *Leonid Brezhnev*
 Social Contract: The: *Rousseau*
 Sohrab and Rustam: *Mathew Arnold*
 Songs of India, The: *Sarojini Naidu*
 Sons and Lovers: *D.H. Lawrence*
 Sound of the Fury, The: *William Faulkner*
 Spirit of the Age: *William Hazlitt*
 Story of a Real Man: *Nikolayev Polevoi*
 Story of My Experiments with Truth:
M.K. Gandhi

Story of My Life: *Moshe Dayan*
 Strangers and Brothers: *C.P. Snow*
 Sunny Days: *Sunil Gavaskar*
 Swami and Friends: *R.K. Narayan*
 Sword and the Sickle: *Mulk Raj Anand*

Talisman: *Sir Walter Scott*
 Tarzan of the Apes: *Edgar Rice Burroughs*
 Tempest: *William Shakespeare*
 Thank You, Jeeves: *P.G. Wodehouse*
 Thirteenth Sun, The: *Amrita Pritam*
 Throne Bird: *Colleen McCulough*
 Through the Indian Looking Glass: *David Selbourne*
 Thus Spake Zarathustra: *Friedrich Wilhelm Nietzsche*
 Time Machine: *H.G. Wells*
 Tom Jones: *Henry Fielding*

Shakespeare's New Poem

Gary Taylor, a leading American expert on William Shakespeare believes he has found a hitherto undiscovered poem by the 16th century English playwright, the Sunday Times announced. He found the 90-line, nine-stanza love poem in an anthology while conducting research in Oxford University's Bodleian Library.

The poem begins: 'Shall I die? Shall I fly lovers' baits and deceits, sorrow breeding?'. Mr. Taylor (32) is Joint General Editor of the Oxford University Press' new "Complete Shakespeare", which has taken eight years to compile. The newspaper said he was regarded as one of the world's most brilliant Shakespearean textual analysts.

"(Reuter: November 24, 1985)"

Treasure Island: *Robert Louis Stevenson*
 Trial, The: *Franz Kafka*
 Trinity: *Leon Uris*
 Tropic of Cancer: *Henry Miller*
 Tryst with Destiny: *S. Gopalan*
 Twelfth Night: *William Shakespeare*
 Two Faces of Indira Gandhi: *Uma Vasudev*
 Two leaves and a Bud: *Mulk Raj Anand*
 Two Women: *Alberto Moravia*
 Ulysses: *James Joyce*
 Uncle Tom's Cabin: *Harriet Beecher Stowe*
 Unto This Last: *John Ruskin*
 Untold Story: *General B.M. Kaul*
 Utopia: *Thomas Moore*

Valley of Dolls: *Jacqueline Susann*
 Vanity Fair: *William Thackeray*
 Vendor of Sweets, The: *R.K. Narayan*
 Vicar of Wakefield: *Oliver Goldsmith*
 Voice of Conscience: *V.V. Giri*

Waiting for Godot: *Thomas Becket*
 Wake Up India: *Annie Besant*
 War and Peace: *Leo Tolstoy*
 Waste Land: *T.S. Eliot*
 Way of all Flesh: *Samuel Butler*
 Wealth of Nations: *Adam Smith*
 We Indians: *Khushwant Singh*
 Westward Ho: *Charles Kingsley*
 Where the Grass is Greener: *David M. Smith*
 White House Years: *Dr. Henry Kissinger*
 Without Fear or Favour: *Harrison E. Salisbury*

Witness to an Era: *Frank Moraes*
 Wuthering Heights: *Emile Bronte*

Yayati: *V.S. Khandekar*

Year of the Upheaval: *Henry Kissinger*
 Yesterday and Toady: *K.P.S. Menon*

Zulfi, My friend: *Piloo Mody*

69. MUSIC AND COMMUNICATION

The history of music can be traced back to the 3rd millennium BC, when the yellow bell (huang chung) had a recognised standard musical tone in Chinese temple music.

The beginning of the plain song and the establishment of order in liturgical music in 4-6 century AD is known as *Ambrosian period* after Bishop Ambrose of Milan. *The Gregorian period* under Pope Gregory I saw church music subjected to strict rules. The beginning of organised instrumental music heralded *the Medieval period* (1100-1300). The age of polyphonic church music is known as *the Renaissance* (1300-1600) followed by *the Baroque* (1600-1750).

The classical period (1750-1800) was the age of concert symphony and concerts. It saw the beginning of the string quartet and Sinfonia Concertants. Church music declined and there were important developments in Opera. Carl Philipp Emanuel Bach (1714-88) and Wolfgang Amadeus Mozart (1756-91) belonged to this period.

Early Romantic period (1800-50) saw high maturity of the symphony and concerto, etc in classical style. It was the period of Romantic opera and the age of the piano virtuosi. Nocturne was invented. It saw the beginning of the symphonic poem and the beginning of nationalism. Ludwig van Beethoven (1770-1827), Franz Schubert (1797-1828), Frederic Francois Chopin (1810-49), and Robert Schumann (1810-56), were among the principal composers.

High Romantic period (1850-1900) saw the development of nationalism. The symphonic and tone poems matured and music drama emerged. Richard Wagner (1813-83), Johannes Brahms (1833-97), and Pyotr Il'ich Tchaikovsky (1840-93), belonged to this period.

Modern period begins in 1900, marked by impressionism and post-romanticism, Gigantism, Neo-classicism and other reactionary movements. It also saw Atonalism. Principal composers: Claude Debussy (1862-1918), Richard Strauss (1864-1949), Igor Stravinsky (1882-1971), Samuel Barber (b. 1910), and others.

Musical Records: Among the composers of the classical period, most rapid was *Wolfgang Amadeus Mozart* (1756-91) of Austria, who wrote c.1,000 operas, operettas, symphonies, violin sonatas, divertimenti, serenades, motets, concertos for piano and many other instruments, string quartets, other chamber music, masses and litanies, of which only 70 were published before he died aged 35.

The most massive orchestra ever assembled was one of 20,100 at the Ullevaal Stadium, Oslo, of Norges Musikkorps Forbund bands from all Norway on June 28, 1964. On June 17, 1872, *Johann Strauss* the younger (1825-99) conducted an orchestra of 987 pieces supported by a choir of 20,000 at the World Peace Jubilee in Boston, USA. The number of first violinists was 400.

Great attendance: The greatest attendance at any classical concert has been 400,000 for the Boston Pops Orchestra, conducted by *Arthur Fiedler* (1895-1979) at the Hatch Memorial Shell, Boston, USA, on July 4, 1976. At the 1978 concert the 83-year-old conductor was presented with a testimonial bearing a record 500,000 signatures.

Largest Paying Audience: The largest paying audience ever attracted by a solo performer is an estimated 175,000 in the

Maracana Stadium, Rio de Janeiro, Brazil, to hear *Frank Sinatra* (b. 1915) on Jan. 26, 1980. Elton John entertained an estimated 400,000 in Central Park, New York City, at a free concert in the summer of 1980.

Greatest Sales: The singers with the greatest sales of any group have been *the Beatles*. This group from Liverpool, Merseyside, England, comprised *George Harrison*, (b.feb.25, 1943), *John Ono Lennon*, (F.Oct.9,1940- Dec.8,1980), *James Paul McCartney*, (b.June 18, 1942) and *Richard Starkey, alias Ringo Starr* (b. July, 1940). The all-time Beatles sales by the end of 1982 have been estimated by EMI at over 1,004 million discs and tapes.

All 4 ex-Beatles sold several million further records as solo artists. Since their break-up in 1970, it is estimated that the most successful group in the world in terms of record sales is the Swedish foursome ABBA (Agnetha Faltskog, Anni-Frid Lyngstad, Bjorn Ulvaeus and Benny Andersson) with a total of 125 million discs and tapes by April 1983.

Great Songwriter: In terms of sales of single records, the most successful of all song writers has been *Paul McCartney*, formerly of the *Beatles* and now of the *Wings*. Between 1962 and Jan. 1, 1978 he wrote jointly or solo 43 songs which sold a million or more.

Albums: The best selling album of all time is the double album (4 sides) of the soundtrack of the film *Saturday Night Fever* with 25 million copies globally. The most popular of the songs were written by the *Bee Gees* comprising the Gibb brothers, Barry Alan (b.Isle of Man, British Isles, Sept.1, 1946) and the twins Robin and Maurice (b.Dec 22, 1949).

Bing Crosby (1904-77), selling 200,000,000 records from the 2600 singles and 125 albums becomes the most successful solo recording artist. *Elvis Presley* (1935-77), with 170 major hits as singles and over 80 top selling albums from 1956, continuing after his death, it may be assumed that it was he who must have succeeded Crosby as the top-selling Solo artist of all-time.

The Cinema: The greatest impetus to the development of Cinematography came from the inventiveness of Etienne Jules Maray in the 1870s. Dim moving outlines were

Number of cinemas

(more than 3000)

USA	16965
USSR	14700
Italy	7495
India	6232
France	4322
China	4000
Spain	3800
Czechoslovakia	3248
Selected Others:	
Japan	2364
Argentina	1794
UK	1604
Sweden	1210
Australia	900
W. Germany	839
South Africa	700
New Zealand	200

Attendance

(In millions of seats per year)

China	22500
India	3285
USA	1030
Italy	300
France	177
Japan	164
W. Germany	144
UK	101

The all-time record figure for any country was 4940 million in the USA in 1929. The highest average attendance per capita per annum is in the Philippines (pop 46.3m) at 19.06 (1979-80).

Film production

(Feature films of 1 hr. minimum duration)

India	714
Japan	335
France	234
Turkey	195
Philippines	170
USA	167
USSR	151
Thailand	150
Selected others:	
Germany (E&W)	83
Spain	73
Canada	70
Czechoslovakia	46
UK	38
Australia	18
Sweden	18
China	12

(Source: UNESCO. These figures cover the period of 1977-1981)

achieved in New York by Louis Aime Augustine Le Prince as early as 1855. The earliest public showing was given in Paris on 22nd March 1895 and the first all-talking feature was screened in New York in 1928.

Most expensive: The highest-ever budgeted film has been *Star Trek* which received its world premiere in Washington D.C. on Dec.6, 1979. Paramount Studios stated that the cost of this space epic directed by Robert Wise and produced by Gene Roddenberry, was \$46 million. A figure of \$60 million has been attributed to *Superman II* but never substantiated.

Highest Box Office Gross: The film which has had the highest world gross earnings is Steven Spielberg's *ET: the Extra-Terrestrial*, released June 11, 1982, and which by Jan.2, 1983 had grossed \$ 322 million. On May 28, 1983 *The Return of the Jedi* (20th Century Fox) grossed \$8,440,105 for a single day record, and a unique \$100 million in its first month. *Star Trek II* grossed a record \$14,347,221 in 1,621 theatres on its opening weekend from June 4-6, 1982.

Highest Earnings: The highest rate of pay in movie history was set by Marlon Brando (b.Apr.3, 1924) for his brief part in *Superman*. He reportedly received \$3,700,000 and a further \$15 million after suing for a contracted share of box office royalties. In July 1980 it was reported that Burt Reynolds (b.Feb 11, 1936) received \$238,095 per day from 20th Century-Fox for his part in *Cannonball Run*. Sylvester Stallone reportedly received \$12 million for his role in *Over the Top* in Sept. 1983.

Character Most Portrayed: The Character most frequently recurring on the screen is *Sherlock Holmes*, created by Sir Arthur Conan Doyle (1859-1930). Sixty-one actors portrayed him in 175 films between 1900 and 1980.

Oscars Most: Walter (Walt) Elias Disney (1901-66) won more "Oscars"—the awards of the United States Academy of Motion Picture Arts and Sciences, instituted May 16, 1929 for 1927—8—than any other person. The physical count comprises 20 statuettes, and nine other plaques and certificates including posthumous awards.

The only person to win four Oscars in a starring role has been Miss Katharine Hep-

Longest Run

The longest continuous run of any show in the world is The Mousetrap by Dame Agatha Mary Clarissa Christie (1890-1976). This thriller opened Nov.25, 1952, at the Ambassadors Theatre London, (capacity 453) and moved after 8,862 performances "down the road" to St. Martin's Theatre, Mar. 25, 1974.

The 30th Anniversary performance, Nov. 25, 1982 was the 12,481st. The Vicksburg Theatre Guild played Mrs. Boyle over 4,000 times to 1967. The Vicksburg, Mississippi, have been playing the melodrama Gold in the Hills, by J. Frank Davis discontinuously but every season since 1936.

Most Durable Leading Actress: Dame Anna Neagle, (b.Oct.20, 1904) played the lead role in Charlie Girl at the Adelphi Theatre, London for 2,062 of 2,202 performances between Dec.15, 1965 and Mar.27, 1971. She played the role a further 327 times in 327 performances in Australasia.

burn, formerly Mrs Ludlow Ogden Smith (b. Hartford, Conn., Nov.9, 1909), in Morning Glory (1932-3), Guess Who's Coming to Dinner (1967), The Lion in Winter (1968) and On Golden Pond (1981). She was 13 times nominated.

Only 4 actors have won two Oscars in starring roles--Frederic March (1897-1975) in 1932 and 1946, Spencer Tracy in 1937 and 1938, Gary Cooper in 1941 and 1952, and Marlon Brando in 1954 and 1972. Edith Head (Mrs Wiard B. Ihnen) (d.1981) won eight individual awards for costume design. Oscars are named after Mr. Oscar Pierce of Texas.

The films with most awards have been *Ben Hur* (1959) with 11, followed by *Gone With the Wind* (1939) with 10 and *Westside Story* (1961) with 10. The film with the highest number of nominations was *All About Eve* (1950) with 14. It won six. The youngest ever winner was Shirley Temple (b.Apr.23, 1928) aged 6 in 1934 and the oldest George Burns, (b.Jan 20, 1896) aged 80 for *The Sunshine Boys* in 1976

Radio. The world's first advertised broadcast was made on Dec. 24, 1906 by the Canadian-born Prof. Reginald Aubrey Fessenden (1868-1932) from the 420-ft/128-m mast of the National Electric Signalling Company at Brant Rock, Mass. The transmission included *Handel's Largo*. Fessenden had achieved the broadcast of speech as early as November, 1900 but this was highly distorted.

The earliest transatlantic wireless signals (the letter S in Morse Code) were received by *Marconi, George Stephen Kemp* and *Percy Paget* from a 10 KW station at *Pidhu*, Cornwall, England, at Signal Hill, St. John's, Newfoundland, at 12.30 p.m. Dec. 12, 1901. Human speech was first heard across the Atlantic in November 1915 when a transmission from the US Navy station at Arlington, Virginia, was received by US radio-telephone engineers on the Eiffel Tower, Paris.

The first patent for a system of communication by means of electro-magnetic waves, numbered No. 12039, was granted June 2, 1896 to the Italian—Irish *Marchese Guglielmo Marconi*, (1874–1937). A public demonstration of wireless transmission of speech was, however, given in the town square of Murray, Kentucky, in 1892 by *Nathan B. Stubblefield*. He died, destitute, March 28, 1928. The first permanent wireless installation was at the Needles on the Isle of Wight, Hampshire, England, by Marconi's Wireless Telegraph Co. Ltd., in Nov. 1896.

Radio Sets ★ (Thousands)

World	1316000
W. Europe	266700
USSR & E. Europe	121800
Middle East & N. Africa	41100
South Africa	8000
Other African Countries	26200
China	55000
India	30000
Japan	90000
Other Asian Countries	78400
Australasia, Pacific & Oceania	19300
United States	450000
Canada	27000
Latin America	97800
West Indies	5000

★Source: BBC 1980 Figures

Electronic Classical

"Painters Marc Chagall, Paul Klee and Juan Miro told me that they had been able to see new inner vision and paint much better while listening to my 'new synthesiser-based electronic western classical, music', said the world-renowned and prodigiously inventive West German music composer, Karlheinz Stockhausen in Bombay.

Stockhausen who is recognised as the prophet of the "new" electronic western classical movement, was explaining his revolutionary system which has thrown overboard century-old concepts and ideas about western classical music.

Stockhausen who has been hailed as the "messiah of modern music" for devising his Stockhausen system of notation and for capturing the nuances and subtleties of electronic classical music said western classical and all music was evolutionary by nature.

Stockhausen said great composers such as Mozart, Bach, Beethoven and Wagner had faced ridicule and contempt while presenting their then revolutionary form of classical music during their life-time and had only been recognised much later. He too, had faced scorn and ridicule initially but had since been accepted as the new innovator.

"The Stockhausen system and traditional classical music is now being taught in all high schools in West Germany", he said.

"If you want to listen to new music, any music, keep your mind and ears open, shut your eyes and take in the mysterious flow of rhythms and micro-tones and expansion or sub-division of notes and, may be, you will see and hear and understand new dimensions that you had never dreamt of before," Stockhausen said.

[Times of India: Nov. 19, 1985]

World Press

DAILY NEWSPAPERS*

	Total	Estimated Total Circulation ¹	Circulation per 1000 inhabitants
World ²	8210	443	136
Africa	180	9	21
America (N&S)	3110	92	158
Asia ²	2380	107	72
Europe	1740	127	264
Oceania	110	6	268
USSR	690	102	394

By Country ³		Circulation in 000's	
USA	1829	62159	287
India	929	10672	—
USSR	690	102	394
Turkey	493	—	—
W. Germany	412	25170	423

1 millions.

2 excluding China, N. Korea, Viet-Nam.

3 1977 data.

* Source: UNESCO Statistical Year Book 1979.

Major Daily Newspapers

		Circulation
Australia	Sun News Pictorial	635000
Canada	Toronto Globe & Mail	310034
China	People's Daily	6000000
Egypt	Al Ahram	500000
France	Le Figaro	468811
	Le Monde	440360
W. Germany	Die Welt	230639
	Frankfurter Allgemeine Zeitung	329449
	Bild Zeitung	4892694
Italy	Corriere della Sera	575665
	La Stampa	350582
Japan	Yomiuri Shimbun ¹	8785477
	Asahi Shimbun ¹	7502150
Spain	El Pais	128338
USA	Washington Post	601417
	Chicago Sun-Times	657275
	Chicago Tribune	789767
	New York Daily News	1554604
	New York Times	914938
	Wall Street Journal ²	1798416
	Los Angeles Times	1024322
USSR	Pravda	10700000

1 all editions.

2 national edition

Most Assiduous Radio Ham: Richard C. Spenceley (d. July 30, 1982) of KV4 AA at St. Thomas, Virgin Islands built his contacts (QSO's) to a record level of 48,100 in 365 days in 1978.

Most Stations: The US has the greatest number of radio broadcasting stations. There were 9,317 authorised broadcast stations in Feb. 1982 of which 4,641 were AM (Amplitude Modulation) and 4,676 FM (Frequency Modulation).

Television. The invention of television, the instantaneous viewing of distant objects by electrical transmissions, was not a single act but a process of successive and inter-dependent discoveries. The first commercial cathode ray tube was introduced in 1897 by *Karl Ferdinand Braun* (1850-1918), but was not linked to "electric vision" until 1907 by *Boris Rosing* of Russia in St. Petersburg (now Leningrad). *A. A. Campbell Swinton* (1863-1930) published the fundamentals of television transmission June 18, 1908 in a brief letter to *Nature* entitled "Distant Electric Vision".

The earliest public demonstration of television was given on Jan. 27, 1926 by *John Logie Baird* (1888-1946) of Scotland, using a development of the mechanical scanning system suggested by *Paul Nipkov* in 1884. He had achieved the transmission of a Maltese Cross over 10 ft 3.05 m at 8, Queen's Arcade, Hastings, East Sussex, England, in February 1924 and the first facial image (of William Taynton, 15) on Oct. 30, 1925. Taynton had to be bribed with 2s.6d.

Earliest Service. The world's first high definition (i.e. 405 lines) television broadcasting service was opened from Alexandra Palace, London, Nov. 2, 1936, when there were about 100 sets in the United Kingdom. The Chief Engineer was Mr. Douglas Birkinshaw. A television station in Berlin, Germany, made a low definition (180 line) transmission from Mar. 22, 1935. The transmitter burnt out in Aug. 1935.

The earliest transatlantic transmission by satellite was achieved at 1 a.m. July 11, 1962, via the active satellite Telstar 1 from Andover, Maine, to Pleumeur Bodou, France. The picture was of *Frederick R. Kappell*, Chairman of the American Telephone and Telegraph Company, which owned the satellite.

Olympian T.V.

The greatest estimated number of viewers worldwide for televised event is 1,000 million for the live and recorded transmissions of the XXth and XXIst Olympic Games in Munich, W. Germany and Montreal, Canada, in 1972 and 1976. The estimate for the papal visit to Ireland by Pope John Paul II, Sept. 29, 1979 was also 1,000 million as was that for the World Cup Final in Madrid, July 11, 1982.

Largest Production: *The BBC production of the 37 plays of Shakespeare in 1978-84 cost a minimum of £6,800,000 (now \$10,200,000). The new series was conceived by its producer Cedric Messina.*

Jerry Lewis, whose telethon over the 1981 Labor Day weekend made a record \$31,498,772 for the Muscular Dystrophy Association. Johnny Carson is paid \$5 million annually for "Tonight", his show, now down to one hour, on which he appears 4 times weekly, making him the highest paid performer on the air. Barbara Walters is the highest paid news and current affairs interviewer at about \$1 million a year.

The first "live" broadcast was made on July 23, 1962 and the first woman to appear was the *haute couturiere*, Ginette Spanier, directrice of Balmain, the next day.

Longest Telecast. The longest pre-scheduled telecast on record was a continuous transmission for 163 hr 18 min by GTV 9 of Melbourne, Australia, covering the Apollo XI moon mission, July 19-26, 1969. The longest continuous TV transmission under a single director was the Avro Television Production *Open het Dorp* transmitted in the Netherlands, Nov. 26-27, 1962 for 23 hr 20 min under the direction of *Theo Ordeman*.

The world's most durable TV show is *NBC's Meet the Press* first transmitted Nov. 6, 1947 and weekly since Sept. 12, 1948, originated by *Lawrence E. Spivak*, who appeared weekly as either moderator or panel member until 1975. On Dec. 11, 1980 *Mike Douglas* presented the 4,754th version of his show started in 1960.

T.V. Receivers* (Thousands)

World	546000
W. Europe	139400
USSR & E. Europe	105500
Middle East & N. Africa	11800
South Africa	2000
Other African countries	2400
China	7000
India	1000
Japan	60000
Other Asian Countries	18900
Australasia, Pacific and Oceania	6800
United States	140000
Canada	12000
Latin America	37500
West Indies	1500

Sale rate per 1000 inhabitants:

Iceland	554
Japan	546
Sweden	528
E. Germany	496
Finland	465
Bermuda	442
Norway	430
Netherlands	420
Switzerland	414
UK	410

*Source: BBC, 1980 figures.

The December 1983 projection for US TV households is 84,800,000, with 32.2 million on Cable TV, 17.8 million on Pay TV and 25 million on Subscription satellite TV, with 3.4 million having video disc or video cassette. The number of homes with colour sets was 71,400,000 (88%) by January 1982.

Pravda from US

Pravda, the Soviet Communist Party newspaper, is to be printed in the United States—by a capitalist, according to plans announced in New York in September 1985.

"There is huge interest here in things Russian", said Charles Cox, 64-year-old retired publisher, quoted by New York Times. "We are going to open up a window into Russia that doesn't exist now for Americans."

What is now available here to libraries, political scientists and private Americans is a weekly digest of translations from selected articles in Pravda and other Soviet publications.

The proposed daily edition of Pravda, promises to be the only English translation of the entire paper in its original format.

It plans to retain the same political messages that make Pravda a must reading for students of the Soviet Union and the Communist Party at home and abroad, the Times reported. Unlike other US papers, the new English Pravda will have no advertising.

PTI: Sep. 20, 1985

70. POPULATION EXPLOSION

World population growth is slowing down—but it could be over 100 years before it finally stops. By that time the world's population will be 10.2 billion, compared with today's population of about 4.84 billion.

At present there are 76 million more births than deaths on our planet each year. If present rates continue, by the year 2000, there will be 100 million more births than deaths. A billion people have been added in the last 13 years and the next billion will be added in 12 years.

Nearly all the growth will be in what are now the developing countries. By the time of stabilization about 2095, 8.8 of the 10.2 billion

will live in Africa, Asia or Latin America. South Asia and Africa alone will account for 60 per cent of the world's population.

Small the Rule. Even this gradual slowing down assumes that the world can maintain the present level of population programmes and policies and that families will be smaller as a result. Otherwise growth may continue and ultimate world population could be as high as 14.2 billion.

On the other hand, if small families quickly became the rule worldwide, population might peak at a level of 7.7 billion about the middle of the 21st century.

These are the latest *United Nations* projections and are based on the most recent information available. Data are much more reliable than in earlier projections, since many countries have carried out accurate censuses recently. The figures show that *women today are having fewer children than their older counterparts did at the same age, and that the average family in most developing countries is smaller than it used to be.*

Impressive gains have been made during the last decade in enabling people to exercise the basic right to plan their family's size. *In India, the proportion of married women aged 15 to 44 who practise family planning has increased from 8 per cent to 23 per cent in a decade.* In Malaysia the rise has been from 6 per cent to 36 per cent and in Thailand from 10 per cent to 39 per cent in the same period. Mexico, a late-comer to population policies, has seen contraceptive use rise from 13 per cent to 40 per cent in only five years.

Problem Persists. But the population problem has by no means been solved:

- Although the rate of growth is falling, present growth rates are still higher than in 1950-55.
- There are still large gaps between the desire for smaller families and the reality. In Pakistan, for example, three-quarters of women in the child bearing age-groups have knowledge of family planning but only a third have access to the means; although nearly half of married women do not want to have another child, only 6 per cent are taking practical steps to avoid it.
- Although families are becoming smaller, women in developing countries still want to have between three and five children. A stable population requires an average of only two children for each woman.
- Annual additions to world population will increase for the rest of the century. This is because the birth rate, although declining, is calculated on an ever-increasing base. The net addition to world population is estimated now at 78 million; by 2000 it will be 90 million.

Basic Needs. Even during the present century we have not provided for the basic needs of nearly half of the world's population. Global recession and slow progress in development plans have helped to increase the numbers of the poor in both developed and developing countries. Population pressures will be more acutely felt as long as large-scale poverty, malnutrition and illhealth persist. The people of the developing countries, where living standards are lowest and population growth highest, will be hardest hit.

Resources and living conditions in their turn help determine family size. Better health services for mothers and children, lower infant mortality, wider access to education, greater opportunities for women and reductions in disparities of income and wealth are all important in the move towards smaller families. Even in societies with generally low income, rural families are smaller when there is access to health and education.

Global development and prospects for global peace are intertwined. Each depends on an understanding of what is happening in population. Population stability beyond the year 2000 will be crucial to both development and peace.

Malthusian Theory. Some two centuries ago (1789), the Rev. Thomas Malthus, then an unknown English curate, published a booklet—*Essay on Population*. In this book Malthus made the terrible prognosis that human population will soon outrun the means of subsistence (food supply). Ever since, the nations of the world have been keeping their fingers crossed, mutely watching the galloping population and wondering when the doom will fall. But things do not work out quite the way that Malthus predicted.

True, population kept mounting without a pause. In 1830—some fifty years after the Malthusian prognosis—human population reached one thousand million for the first time in history. In another century (1830-1930) it had doubled itself to 2000 million. In about a generation (1930-1960) a third thousand million was added. In a little more than a decade thereafter, (1960-1974) the population increased by about 700 million.

But surprisingly, food production kept pace with population demolishing the Malth-

World Population 1984

Region, Country/	Total Population (000s)
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ASIA	2777385
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Afghanistan	14292
Bangladesh	98464
Bahrain	414
Bhutan	1388
Burma	38513
China	1051551
Cyprus	659
Democratic Kampuchea	7149
Dem. Peo. Rep. of Korea	19630
Democratic Yemen	2066
East Timor	638
Hong Kong	5498
India	746742
Indonesia	162167
Iran	43799
Iraq	15158
Israel	4216
Japan	119492
Jordan	3375
Korea	59939
Kuwait	1703
Lao People's Dem. Rep.	4315
Lebanon	2644
Malaysia	15204
Mongolia	1851
Nepal	16107
Oman	1181
Pakistan	98971
Philippines	53395
Qatar	291
Republic of Korea	40309
Saudi Arabia	10824
Singapore	2540
Sri Lanka	16076
Syrian Arab Republic	10189
Thailand	50584
Turkey	48811
United Arab Emirates	1255
Viet Nam	58307
Yemen	6386

AFRICA	536685
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Algeria	21272
Angola	8540
Burkina Faso	6768
Benin	3890
Botswana	1042
Burundi	4503
Cameroon	9467

Cape Verde	317
Central African Republic	2508
Chad	4901
Comoros	443
Congo	1695
Egypt	45657
Equatorial Guinea	383
Ethiopia	35420
Gabon	1146
Gambia	630
Ghana	13044
Guinea	5301
Guinea-Bissau	875
Ivory Coast	9474
Kenya	19761
Lesotho	1481
Liberia	2123
Libyan Arab Jamahiriya	3471
Malawi	6788
Mali	7825
Mauritania	1832
Mauritius	1031
Morocco	22848
Mozambique	13693
Namibia	1507
Niger	5940
Nigeria	92037
Reunion	555
Rwanda	5903
Senegal	6352
Sierra Leone	3536
Somalia	5423
South Africa	31586
Sudan	20945
Swaziland	630
Togo	2838
Tunisia	7042
Uganda	15150
United Rep. of Tanzania	21710
Zaire	32084
Zambia	6445
Zimbabwe	8461

AMERICAS	658258
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Argentina	30094
Barbados	262
Bolivia	6200
Brazil	132648
Canada	25302
Chile	11878
Colombia	28110
Costa Rica	2534
Cuba	9966
Dominican Republic	6101
Ecuador	9090

El Salvador	5388	New Zealand	3264
Guadeloupe	319	Other Melanesia	556
Guatemala	8165	Papua New Guinea	3601
Guyana	936	Polynesia	498
Haiti	6419		
Honduras	4232		
Jamaica	2290		
Martinique	312		
Mexico	77040		
Nicaragua	3162		
Other Caribbean	769		
Panama	2134		
Paraguay	3576		
Peru	19197		
Puerto Rico	3404		
Suriname	352		
Trinidad and Tobago	1105		
United States of America	235681		
Uruguay	2990		
Venezuela	17819		
Windward Islands	419		

Source: UNFPA — United Nations Fund for Population Activities.

EUROPE

490456

Albania	2985
Austria	7489
Belgium	9877
Bulgaria	112339
Czechoslovakia	15588
Denmark	5141
Finland	4859
France	54449
German Dem. Rep.	16658
Germany, Fed. Rep.	61214
Hungary	10786
Iceland	239
Ireland	3555
Italy	56724
Luxembourg	363
Malta	380
Netherlands	14456
Norway	4140
Poland	37228
Portugal	10008
Romania	22897
Spain	38717
Sweden	8284
Switzerland	6309
United Kingdom	55624
USSR	275761
Yugoslavia	23028

OCEANIA

24460

Australia	15519
Fiji	674
Micronesia	348

usian theory that population would increase in geometrical progression[‡] while agricultural production would only increase in arithmetical progression.[‡] Large scale mechanised farming was the first great step in agricultural expansion. Then came the Green Revolution and the techniques of intensive cultivation. The Malthusian ghost of food shortage was thus laid—apparently for ever.

For two decades ending in 1972, the world had in fact an oversupply of cereal grains and the main exporters were forced to cut down production drastically. In 1972 the tables were suddenly turned. Agricultural production slumped in many parts of the world, mainly on account of weather.

Severe shortages of food verging on famine plagued many countries. The pressure was so great that it was even suggested that advanced nations should cut down on meat in order to save more foodgrains for mankind.[‡] The critical food situation remained unchanged through 1973 and continued well into 1974.

World Meet 1974. It was at this time when the food horizon was overcast, that the UN summoned two World Conferences—one on Population at Bucharest in Aug. 1974 and the other on Food at Rome in Nov. 1974. The two Conferences worked out an overall assessment of world food production vis-a-vis population. What emerged from the assessment was that the world food production, including all items of food (foodgrains, tubers and other vegetables and meat, fish, milk and eggs) did not materially fall. The trouble lay in the alignment of production between the various countries of the world.

Advanced countries, by and large, remained surplus in food production. It was the developing countries that registered heavy shortages in vital articles of food. The con-

[‡]Geometrical progression 1,2,4,8,16 etc.

Arithmetical progression 1,2,3,4,5 etc.

[‡]The assumption is that cattle have to be fed 20 pounds of grain, for every pound of beef.

sequence was that the advanced countries faced no problem—either of population or of food, whereas the developing countries faced it both ways—in population and in food supply.

Zero Growth Rate. It has been taken for granted that the advanced nations faced no population problem since they were steadily settling down to the zero growth rate in population. *Zero growth means that the population will keep steady through generations. In other words, births will be just enough to compensate deaths, never more.*

Our faith in zero growth rate was so intense that we had overlooked the other end of the problem, namely that births may be less than deaths and thus pull down the population to dangerous limits. The zero rate has dispelled the nightmare of Malthusian overpopulation. But it has at the same time turned up another nightmare—underpopulation—at least in Europe. The latest reports show that Europe is getting underpopulated.

While India and most of the world wrestle with the staggering problem of increasing

numbers, much of Western Europe is preoccupied with the opposite problem. In fact there are economists in Europe who think that zero population growth is their biggest enemy.

Optimum Population. The ideal population is the optimum population. We speak of overpopulation when numbers exceed resources and of underpopulation when production falls short of numbers. If there is overpopulation there will not be enough goods to go round. If there is underpopulation there will not be enough hands to produce the necessary goods and services.

Some people think that we shall rather have a shortage of goods than a surplus of men. The lesser evil, no doubt, but evil none the less. If we decide to get along with less goods and services, we shall have to choose a very low standard of life and opt for dissatisfaction all round. A society accustomed to supersonic transport, air-conditioned houses, piped water, electric gadgets, chic clothes and choice foods will soon find the going rough. It will not be long before 'death wish' overtakes all.

71. 40 YEARS OF UNITED NATIONS

The United Nations at 40, whatever its failures, still remains the hope and conscience of the world, more especially of the smaller nations among its 159 members. The UN and its 17 independent specialised agencies and 14 major Programmes and Funds embrace almost every man in every corner of the globe.

On the occasion of the 40th anniversary, 100-odd Presidents and Prime Ministers, Kings and dictators gathered at the 39-storied world organisation headquarters by the New York's East River, in September 1985.

The historic anniversary session of the General Assembly was attended by U.S. President Ronald Reagan, British Prime Minister Margaret Thatcher and Prime Minister Rajiv Gandhi. The Soviet Union was represented by their new Foreign Minister, Eduard Shevardnadze.

The UN was founded to maintain peace and security in a world that had just been passing through a devastating war and nuclear bombing.

Forty years later, although there has been

no world war yet, numerous smaller wars and conflicts still rage or smoulder and the powers are divided over the threat posed by the nuclear weapons.

The world is also riven by differences between the rich and the poor—between developed nations and developing nations—over the need to bring about a new international economic order to bridge the wide gap between the living standards in those two worlds.

A major issue that dominated the anniversary session was the apartheid regime in South Africa which has been the scene lately of the increasingly bloody confrontations between the depressed African people and the minority white rulers

The common theme in the speeches of Rajiv Gandhi, Chinese Premier Zhao Ziyang, and Dumas, the French Foreign Minister, among others, was the imperative need for mankind to step back from the nuclear brink. The US President, while not hiding his distaste for Marxism-Leninism's "war with people" around the world, said he sought a "fresh start" in US-Soviet relations despite deep and abiding differences. Soviet leader Mikhail Gorbachev, in his message called for ending the arms race on Earth and preventing it in space, in an obvious reference to Reagan's *Star Wars* programme.

Rajiv Gandhi pointed to the "wide cracks" showing in the present world order and the contradiction between international order and nuclear weapons, freedom and racism, science and poverty. He commended the six-nation Delhi declaration issued earlier on nuclear disarmament as a "practical programme". Mr. Dumas, however, said that France would maintain its independent nuclear defence system until the superpowers give a clear lead in nuclear disarmament.

Japanese Prime Minister Nakasone "apologised" for Japan's "ultranationalism" that had led to World War II and promised to fight the revival of militarism in his country. Rajiv spoke for the non-aligned movement and the third world in urging a new consensus on development that will banish hunger and poverty.

Even though there were 150 items on the agenda of the anniversary session, everything submerged in the rhetoric of the world leaders. Not even a consensus declaration could materialise.

UN also celebrated the 25th anniversary of its decolonisation declaration consecutively with the territory it has tried hardest to liberate still far from independence. South-West Africa or Namibia represents one of the organisation's great frustrations among what is generally viewed as its successful effort to bring colonies to independence. Since 1960, when the UN issued the declaration on de-colonisation, 59 territories inhabited by 80 million people have become independent or opted to join the comity of independent states.

Historic Charter. United Nations, an association of sovereign states bound by a

Charter to maintain international peace and security came into being on 24th Oct. 1945. The Charter was signed by the delegates of 50 nations on 26th June, 1945 at San Francisco. The UN has now on its rolls almost all the independent countries of the world.

For a long time China was represented in the UN by Taiwan which styled itself Nationalist China. Communist China which truly represented China was kept out of the UN mainly on account of the US veto.

This anomaly was removed in 1971 by admitting Communist China as the representative of all China in the UN. Red China thus became a permanent member of the Security Council. Taiwan not only lost its permanent seat in the Council but also its primary membership of the UN.

New Economic Order. In Dec. 1974 the UN adopted a Charter of Economic Rights. This charter consisting of 34 articles is a landmark in the history of UN. It includes the right of each state "to freely exercise full permanent sovereignty over its wealth and natural resources, to regulate and exercise authority over foreign investments within its national jurisdiction and to nationalise, expropriate or transfer the ownership of foreign property".

The 1974 declaration of rights recognised the imperative necessity of reducing disparities between developed, developing and undeveloped countries of the world. It envisaged a New International Economic Order (NIEO). To achieve this new order the UN Development Programme (UNDP) was inaugurated in 1975 under a Director General of Development.

Principal Organs of the UN are: General Assembly, Secretariat, Security Council, Trusteeship Council, Economic and Social Council and International Court of Justice.

Head Quarters: First Avenue, UN Plaza, New York City, N.Y., USA.

General Assembly. The General Assembly of the UN is the nearest that the world has yet come to the visionary 'Parliament of Man'. The Assembly consists of the representatives of all the member states. Each state has one vote, but many send 5 representatives. The General Assembly meets at least once in a year. Special

sessions may be summoned by the Secretary General, on a request by the Security Council.

The General Assembly passes the annual budget of the UN and determines the contribution payable by each member. It receives and considers the reports of the special committees including the Security Council. Important questions are decided by a two-thirds majority and other questions by a simple majority.

The General Assembly elects the non-permanent members of the Security Council, the members of the Economic and Social Council and the elected members of the Trusteeship Council. The Judges of the International Court of Justice are elected by the General Assembly, in conjunction with the Security Council. The General Assembly elects its own President and Vice Presidents every year.

2. Security Council consists of 15 members, each of which has 1 vote. There are 5 permanent and 10 non-permanent members elected for a 2-year term by a two-thirds majority of the General Assembly. The permanent members have the power to veto any move.

Retiring members are not eligible for immediate re-election. Any other member of the United Nations will be invited to participate without vote in the discussion of questions specially affecting its interests.

The Presidency of the Security Council is held for 1 month in rotation by the member states in the English alphabetical order of their names.

Permanent Members: China, France, USSR, UK, USA. **Non-permanent Members:** Australia, Denmark, Madagascar, Thailand, Trinidad and Tobago, (until 31 Dec. 1986), Bulgaria, Congo, Ghana, UAE, Venezuela (until 31 Dec. 1987).

3. Economic & Social Council is responsible under the General Assembly for carrying out the functions of the United Nations with regard to international economic, social, cultural, educational, health and related matters.

The Economic and Social Council consists of 54 Member States elected by a two-thirds majority of the General Assembly. The Coun-

cil has the following Regional Economic Commissions: ECE (Economic Commission for Europe, Geneva); ESCAP (Economic and Social Commission for Asia and the Pacific, Bangkok); ECLA (Economic Commission for Latin America, Santiago, Chile); ECA (Economic Commission for Africa, Addis Ababa); ECWA (Economic Commission for Western Asia, Baghdad).

4. Trusteeship Council. The Charter provides for an international trusteeship system to safeguard the interests of the inhabitants of territories which are not yet fully self-governing and which may be placed thereunder by individual trusteeship agreements. These are called trust territories.

All of the original 11 trust territories except one, the Pacific Islands (Micronesia), administered by the USA, have become independent or joined independent countries.

5. International Court. The International Court of Justice was created by an international treaty, the Statute of the Court, which forms an integral part of the United Nations Charter. All members of the United Nations are *ipso facto* parties to the Statute of the Court. There are 15 judges.

India's Dr. Nagendra Singh is the present President of the Court.

The Court has its seat at The Hague, but may sit elsewhere whenever it considers this desirable. The expenses of the Court are borne by the UN.

6. Secretariat is composed of the Secretary-General, who is the chief administrative officer of the organization, and an international staff appointed by him under regulations established by the General Assembly. However, the Secretary General, the High Commissioner for Refugees and the Managing Director of the Fund are appointed by the General Assembly. The first Secretary General was Trygve Lie (Norway), 1946-53; the second, Dag Hammarskjöld (Sweden), 1953-61; the third, U. Thant (Burma), 1961-71; the fourth, Kurt Waldheim (Austria), 1972-81.

The financial year coincides with the calendar year; accountancy is in US\$. Budget for 1984-85, \$1,587,158,000.

Secretary-General: *Javier Peres de Cuellar (Peru)*, appointed on 1 Jan. 1982 for a 5-year term.

The Secretary-General is assisted by Under-Secretaries-General and Assistant Secretaries-General.

United Nations System. The bulk of the work of the UN, measured in terms of money and personnel, is aimed at achieving the pledge made in Article 55 of the Charter to 'promote higher standards of living, full employment and conditions of economic and social progress and development.'

In addition to the 17 independent specialized agencies, there are some 14 major United Nations programmes and funds devoted to achieving economic and social progress in the developing countries.

UNDP—United Nations Development Programme is the world's largest agency for multilateral technical and pre-investment co-operation. It is the funding source for most of the technical assistance provided by the United Nations system, and UNDP is active in almost 150 countries and territories and in virtually every economic and social sector. UNDP assistance is provided only at the request of Governments and in response to their priority needs, integrated into over-all national and regional plans.

UNICEF—United Nations Children's Education Fund, established in 1946 to deliver post-war relief to children, now concentrates its assistance on development activities aimed at improving the quality of life for children and mothers in developing countries. During 1983, UNICEF was working in over 110 countries with a child population of some 1,300 m, concentrating on basic services for children and maternal health care, nutrition, water supply and sanitation and education.

Executive Director: *James P. Grant (USA)*.

UNFPA—The UN Fund for Population Activities, carries out programmes in over 130 countries and territories. The Fund's aims are to build up capacity to respond to needs in population and family planning; to promote awareness of population problems in both developed and developing countries and possible strategies to deal with them; to assist developing countries at their request in

dealing with population problems. More than 25% of international population assistance to developing countries is channelled through UNFPA.

Executive Director: *Rafael M. Salas (Philippines)*.

Relief Agencies. Humanitarian relief to refugees and victims of natural and man-made disasters is also an important function of the UN system. Among the organizations involved in such relief activities are the Office of the UN Disaster Relief Co-ordinator (UNDRO), the Office of the UN High Commissioner for Refugees (UNHCR) and the UN Relief and Works Agency for Palestine Refugees in the Near East (UNRWA).

UNRWA was created by the General Assembly in 1949 as a temporary non-political agency to provide relief to the nearly 750,000 people who became refugees as a result of the disturbances during and after the creation of the State of Israel in the former British Mandate territory of Palestine.

Commissioner-General: *Olof Rydbeck (Sweden)*.

UNHCR—The office of the United Nations High Commissioner for Refugees was established by the UN General Assembly with effect from 1 Jan. 1951, originally for three years. Since 1954, its mandate has been renewed for successive five year periods.

For its work on behalf of refugees around the world, UNHCR was awarded the Nobel Peace Prize in 1955 and again in 1981.

Headquarters: Palais des Nations, 1211, Geneva 10, Switzerland.

High Commissioner: *Poul Hartling (Denmark)*.

Specialized Agencies. IAEA—The International Atomic Energy Agency, came into existence on 29 July 1957. Its statute had been approved on 26 Oct. 1956, at an international conference held at UN Headquarters, New York. A relationship agreement links it with the United Nations. The IAEA had 112 member states in 1983.

Headquarters: Vienna International Centre, PO Box 100, A-1400 Vienna, Austria.

Director-General: *Hans Blix (Sweden)*.

ILO—International Labour Organisation established in 1919 as an autonomous part of

the League of Nations, is an intergovernmental agency with a tripartite structure, in which representatives of governments, employers and workers participate. In 1969 it was awarded the Nobel Peace Prize. In 1984 it numbered 151 members.

The ILO consists of the International Labour Conference, the Governing Body and the International Labour Office.

Headquarters: International Labour Office, CH-1211 Geneva 22, Switzerland.

Director-General: **Francis Blanchard** (France). Chairman of the Governing Body: **B. G. Deshmukh** (India).

FAO—Food and Agriculture Organization. The UN Conference on Food and Agriculture in May 1943, at Hot Springs, Virginia, set up an Interim Commission in Washington in July 1943 to plan the Organization, which came into being on 16th October 1945.

FAO sponsors the World Food Programme (WFP) with the UN.

Headquarters: Viale delle Terme di Caracalla, Rome, Italy.

Director-General: **Dr. Erdouard Saouma** (Lebanon).

UNESCO—United Nations Educational, Scientific and Cultural Organization. A Conference for the establishment of an Educational, Scientific and Cultural Organization of the United Nations was convened by the Government of the UK in association with the Government of France, and met in London, 1 to 16 Nov. 1945. UNESCO came into being on 4 Nov. 1946.

UNESCO had 160 members in 1984.

WHO—World Health Organization. An International Conference, convened by the UN Economic and Social Council, to consider a single health organization resulted in the adoption on 22 July 1946 of the constitution of the World Health Organization. This constitution came into force on 7 April 1948.

Headquarters: 1211 Geneva 27. Regional Offices: Alexandria, Brazzaville, Copenhagen, Manila, New Delhi and Washington.

Director-General: **Dr. Halfdan T. Mahler** (Denmark).

IMF—International Monetary Fund. The International Monetary Fund was established

on 27 Dec. 1945 as an independent international organization and began operations on 1 March 1947; its relationship with the UN is defined in an agreement of mutual co-operation which came into force on 15 Nov. 1947. The first amendment to the Fund's articles creating the Special Drawing Rights (SDR) took effect on 28 July 1969 and the second amendment took effect on 1 April 1978.

Headquarters: 700 19th St. NW, Washington, D.C., 20431. Offices in Paris and Geneva.

Managing Director: **Jacques de Larosiere** (France).

World Bank. **IBRD—International Bank for Reconstruction and Development** conceived at the Bretton Woods Conference, July 1944, the 'World Bank' began operations in June 1946. Its purpose is to provide funds and technical assistance to facilitate economic development in the poorer countries.

Headquarters: 1818 H.St. NW Washington, D.C.

President: **Alden W. (Tom) Clausen** (USA).

IDA—International Development Association. A lending agency which came into existence on 24 Sept. 1960. Administered by the World Bank, IDA is open to all members of the Bank.

IFC—International Finance Corporation, an affiliate of the World Bank, was established in July 1956. Paid-in capital at 30 June 1984 was \$544.2m, subscribed by 125 member countries. In addition, it has accumulated earnings of \$230.1 m. IFC supplements the activities of the World Bank by encouraging the growth of productive private enterprises in less developed member countries.

President: **Alden W. (Tom) Clausen** (USA).

ICAO—International Civil Aviation Organization. The Convention providing for the establishment of the International Civil Aviation Organization was drawn up by the International Civil Aviation Conference held in Chicago from 1 Nov. to 7 Dec. 1944. A Provisional International Civil Aviation Organization (PICAO) operated for 20 months until the formal establishment of ICAO on 4 April 1947.

Headquarters: 1000 Sherbrooke St. West,

Suite 400, Montreal, Quebec, Canada H3A 2R2.

President: *Dr. Assad Kotaite (Lebanon)*.
Secretary-General: *Yves Lambert (France)*.

Communication. *UPU—The Universal Postal Union* was established on 1 July 1875, when the Universal Postal Convention adopted by the Postal Congress of Berne on 9 Oct. 1874 came into force. The UPU was known at first as the General Postal Union, its name being changed at the Congress of Paris in 1878. In 1980 there were 158 member countries.

Headquarters: Weltpoststrasse 1, 3000 Berne 15, Switzerland.

Director-General: *Mohamed Ibrahim Sobhi (Egypt)*.

ITU—International Telecommunication Union. The International Telegraph Union, founded in Paris in 1865, and the International Radiotelegraph Union, founded in Berlin in 1906, were merged by the Madrid Convention of 1932 to form the International Telecommunication Union. ITU came into being on 1 Jan. 1934.

Headquarters: Place des Nations, 1211 Geneva, Switzerland.

Secretary-General: *Mohammed Mili (Tunisia)*.

WMO—World Meteorological Organization. A Conference of Directors of the International Meteorological Organization (set up in 1873), meeting in Washington in 1947, adopted a Convention creating the World Meteorological Organization. The WMO was formally established on 19 March 1951, when the first session of its Congress was convened in Paris.

Headquarters: Case Postale 5, CH-1211, Geneva 20, Switzerland.

Secretary-General: *G.O.P. Obasi (Nigeria)*.

IMO—The International Maritime Organization, until 1982 known as Inter-Governmental Maritime Consultative Organization (IMCO), was established as a specialized agency of the UN by a convention

drawn up at the UN Maritime Conference held at Geneva in Feb./March 1948.

Headquarters: 4 Albert Embankment, London SE1 7SR.

Secretary-General: *C. P. Srivastava (India)*.

World Trade. *GATT—The General Agreement on Tariffs and Trade* was negotiated in 1947 and entered into force on 1 Jan. 1948. Its 23 original signatories were members of a Preparatory Committee appointed by UN Economic and Social Council to draft the charter for a proposed International Trade Organization. Since this charter was never ratified, the General Agreement, intended as an interim arrangement, has instead remained as the only international instrument laying down trade rules accepted by countries responsible for most of the world's trade. In Nov. 1983 there were 90 contracting parties, with a further 31 countries participating under special arrangements.

Headquarters: Centre William Rappard, 154 rue de Lausanne, 1211 Geneva 21, Switzerland.

Director-General: *Arthur Dunkel (Switzerland)*.

WIPO—World Intellectual Property Organization. The Convention establishing WIPO was signed at Stockholm in 1967 by 51 countries, and entered into force in April 1970. In Dec. 1974 WIPO became a specialized agency of the UN.

Headquarters: 34, Chemin des Colombettes, 1211 Geneva 20, Switzerland.

Director-General: *Arpad Bogsch (USA)*.

IFAD—International Fund for Agricultural Development. The establishment of IFAD was one of the major actions proposed by the 1974 World Food Conference. The agreement for IFAD entered into force on 30 Nov. 1977 following attainment of initial pledges of \$1,000 m. and the agency began its operations the following month.

Headquarters: 107 Via del Serafico, Rome, Italy.

President: *Abdelmushin Al-Sudeary (Saudi Arabia)*.

Members of the UN

159 members as in 1985

Member	Year of Admission		
Afghanistan	1946	El Salvador★	1945
Albania	1955	Equatorial Guinea	1968
Algeria	1962	Ethiopia★	1945
Angola	1976		
Antigua & Barbuda	1981	Fiji	1970
Argentina★	1945	Finland	1955
Australia★	1945	France★	1945
Austria	1955		
		Gabon	1960
Bahamas	1973	Gambia	1965
Bahrain	1971	German Democratic Republic	1973
Bangladesh	1974	Germany, Federal Republic of	1973
Barbados	1966	Ghana	1957
Belgium★	1945	Greece★	1945
Belize	1981	Grenada	1974
Benin†	1960	Guatemala★	1945
Bhutan	1971	Guinea	1958
Bolivia★	1945	Guinea-Bissau	1974
Botswana	1966	Guyana	1966
Brazil★	1945		
Brunei Darussalam	1984	Haiti★	1945
Bulgaria	1955	Honduras★	1945
Burkina Faso★	1960	Hungary	1955
Burma	1948		
Burundi	1962	Iceland	1946
Byelorussia	1945	India★	1945
		Indonesia‡	1950
Cameroon	1960	Iran★	1945
Canada★	1945	Iraq★	1945
Cape Verde	1975	Ireland	1955
Central African Republic	1960	Israel	1949
Chad	1960	Italy	1955
Chile★	1945	Ivory Coast	1960
China★‡	1945		
Colombia★	1945	Jamaica	1962
Comoros	1975	Japan	1956
Congo	1960	Jordan	1955
Costa Rica★	1945		
Cuba★	1945	Kenya	1963
Cyprus	1960	Kuwait	1963
Czechoslovakia★	1945		
		Lao People's Democratic Republic	1955
Democratic Kampuchea†	1955	Lebanon★	1945
Denmark★	1945	Lesotho	1966
Djibouti	1977	Liberia★	1945
Dominica	1978	Libyan Arab Jamahiriya	1955
Dominican Republic★	1945	Luxembourg★	1945
Ecuador★	1945	Madagascar	1960
Egypt★	1945	Malawi	1964
		Malaysia★★	1957
		Maldives	1965
		Mali	1960
		Malta	1964
		Mauritania	1961
		Mauritius	1968

Mexico★	1945	Singapore	1965
Mongolia	1961	Solomon Islands	1978
Morocco	1956	Somalia	1960
Mozambique	1975	South Africa★	1945
		Spain	1955
Nepal	1955	Sri Lanka	1955
Netherlands★	1945	Sudan	1956
New Zealand★	1945	Suriname	1975
Nicaragua★	1945	Swaziland	1968
Niger	1960	Sweden	1946
Nigeria	1960	Syrian Arab Republic★★	1945
Norway★	1945		
		Tanzania††	1961
Oman	1971	Thailand	1946
		Togo	1960
Pakistan	1947	Trinidad and Tobago	1962
Panama★	1945	Tunisia	1956
Papua New Guinea	1975	Turkey	1945
Paraguay★	1945		
Peru★	1945	Uganda	1962
Philippines★	1945	Ukrainian Soviet Socialist Republic★	1945
Poland★	1945	USSR	1945
Portugal	1955	United Arab Emirates	1971
		United Kingdom	1945
Qatar	1971	USA★	1945
		Uruguay†	1945
Romania	1955		
Rwanda	1962	Vanuatu	1981
		Venezuela★	1945
St. Christopher and Nevis	1983	Viet Nam	1977
Saint Lucia	1979		
Saint Vincent and the Granadines	1980	Yemen Arab Republic	1947
Samoa, Western	1976	Yemen, PDR	1967
Sao Tome and Principe	1975	Yugoslavia★	1945
Saudi Arabia★	1945		
Senegal	1960	Zaire	1960
Seychelles	1976	Zambia	1964
Sierra Leone	1961	Zimbabwe	1980

† Formerly Dahomey.

‡ By resolution 2758 (XXVI) of 25 Oct. 1971, the General Assembly decided "to restore all its rights to the People's Republic of China and to recognize the representatives of its Government as the only legitimate representatives of China to the United Nations, and to expel forthwith the representatives of Chiang Kai-shek from the place which they unlawfully occupy at the United Nations and in all the organizations related to it".

† Formerly Cambodia.

‡ By letter of 20 January 1965, Indonesia announced its decision to withdraw from the United Nations "at this stage and under the present circumstances". By telegram of 19 Sept. 1966, it announced its decision "to resume full co-operation with the United Nations and to resume participation in its activities". On 28 Sept. 1966, the General Assembly took note of this decision and the President invited the representatives of Indonesia to take seats in the Assembly.

★ Original Member.

★★ The Federation of Malaya joined the United Nations on

17 Sept. 1957. On 16 Sept. 1963, its name changed to Malaysia, following the admission to the new federation of Singapore, Sabah (North Borneo) and Sarawak. Singapore became an independent State on 9 August 1965 and a United Nations Member on 21 Sept. 1965.

†† Egypt and Syria were original Members of the United Nations from 24 Oct. 1945. Following a plebiscite on 21 Feb. 1958, the United Arab Republic was established by a union of Egypt and Syria and continued as a single Member. On 13 Oct. 1961, Syria resumed its status as an independent State and simultaneously its United Nations membership. On 2 Sept. 1971, the United Arab Republic changed its name to Arab Republic of Egypt.

†† Tanganyika was a United Nations Member from 14 Dec. 1961. Zanzibar was a Member from 16 Dec. 1963. Following the ratification on 26 April 1964 of Articles of Union between Tanganyika and Zanzibar the United Republic of Tanganyika and Zanzibar continued as a single Member changing its name to United Republic of Tanzania on 1 November, 1964.

‡ By an amendment of the UN Charter on Aug. 31, 1964

★ Formerly Upper Volta.

72. WORLD ORGANIZATIONS

Among the international organisations or associations other than the United Nations are the six decade-old Commonwealth and the world's newest regional organisation, SAARC—South Asian Association for Regional Co-operation of India, Maldives, Pakistan, Bangladesh, Sri Lanka, Bhutan and Nepal.

ADB—The Asian Development Bank was initially sponsored by the ECAFE and started functioning in 1966. In 1975, ADB had 27 regional members and 14 non-regional members.

In June 1974, ADB launched the Asian Development Fund (ADF) with a view to providing concessional credits to needy members.

Headquarters: Manila, Philippines.

The Arab League is the outcome of a national awakening of the Arabs, following the fall of the Ottoman Empire in the First World War. A non-official National Arab Conference was held in Jerusalem on Dec. 13, 1931. It unanimously affirmed the long cherished goals of Arab unity and independence in what is known as the Arab Covenant. A preparatory meeting of the General Arab Conference was inaugurated in Alexandria in Sept. 1944. This was attended by representatives from Egypt, Syria, Iraq, Lebanon, Jordan, Saudi Arabia and Palestine. After prolonged discussions the Conference adopted a charter in Oct. 1944. The Arab League was formally instituted on March 22, 1945.

The Arab League consists of a Council, a Secretary General and a few permanent committees.

The League considers itself a regional organisation within the framework of the UN at which its Secretary-General is an observer.

Member countries (21): Algeria, Bahrain, Djibouti, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, Palestine L.O., Qatar, Saudi Arabia, Somalia, Sudan, Syria, Tunisia, UAE, PDR of Yemen, and Yemen Arab Republic.

Secretariat: Tunis.

Secretary-General: Chedli Klibi (Tunisia).

ASEAN—The Association of South East Asian Nations is a regional organization formed by the governments of Indonesia, Malaysia, the Philippines, Singapore and Thailand through the Bangkok Declaration which was signed by the Foreign Ministers of ASEAN countries on 8 Aug. 1967. Brunei joined in 1984. Its aim is to accelerate economic progress and maintain the economic stability of South East Asia.

Each ASEAN capital has an ASEAN National Secretariat. The central secretariat for ASEAN is located in Jakarta, Indonesia, and is headed by the Secretary General, a post that revolves among the member states in alphabetical order every 2 years. Bureau directors and other officers of the ASEAN Secretariat remain in office for 3 years.

Secretary General: Phan Wannamethee (Thailand).

Colombo Plan. Founded in 1950 to promote the development of newly independent Asian member countries, the Colombo Plan has grown from its modest beginning as a group of seven Commonwealth nations into an international organization of 26 countries.

Member Countries: Afghanistan, Australia, Bangladesh, Bhutan, Burma, Kampuchea, Canada, Fiji, India, Indonesia, Iran, Japan, Republic of Korea, Lao People's Democratic Republic, Malaysia, Maldives, Nepal, New Zealand, Pakistan, Papua New Guinea, Philippines, Singapore, Sri Lanka, Thailand, UK and USA.

Headquarters: Colombo Plan Bureau, 12 Melbourne Avenue, PO Box 596, Colombo 4, Sri Lanka.

Commonwealth. The 40-nation Commonwealth represents a third of the nations of the world.

The idea of a Commonwealth of Nations comprising Great Britain, the Dominions and other Territories in the British Empire, was first accepted at the Imperial Conference of 1926. In 1931, the Statute of Westminster recognised the status of the Dominions and defined the relations of the British Crown to the Dominions. The other territories were entitled to become members of the Commonwealth on attaining full self-government. In 1947, the office of the Secretary of State for Dominions was abolished and the Secretary of Commonwealth Relations assumed charge.

The Commonwealth has no written constitution which regulates its functions. Its members are autonomous countries associated with Britain, equal in status, in no way subordinate to one another in any aspect of their domestic or foreign affairs, though united by a common allegiance to the Crown, and freely associated as members of the British Commonwealth of Nations.

Some of the members like Canada, Australia and New Zealand recognise the Queen as the titular head of their States and have Governors-General appointed by the Queen on the recommendation of the State Cabinets. Some like India and Sri Lanka, who have elected Presidents of their own as Heads of State, recognise the Queen as the Head of the Commonwealth only.

Members of the Commonwealth are represented in other Commonwealth countries by diplomatic officers called High Commissioners in the place of Ambassadors representing non-Commonwealth countries.

Britain's entry into the European Economic Community or the European Common Market in 1972 has not altered the relations of Britain with the Commonwealth countries, while it has increased the opportunities of Commonwealth countries to negotiate advantageous commercial agreements with the EEC. India, Sri Lanka and Bangladesh have already established co-operative commercial agreements with the Community.

The present member countries of the Commonwealth are as follows:

Australia, Antigua and Barbuda, Bahamas,

Bangladesh, Barbados, Belize, Botswana, Brunei, Canada, Cyprus, Dominica, Fiji, The Gambia, Ghana, Grenada, Guyana, India, Jamaica, Kenya, Kiribati, Lesotho, Malawi, Malaysia, Maldives, Malta, Mauritius, Nauru, New Zealand, Nigeria, Papua New Guinea, St. Christopher and Nevis, Saint Lucia, St. Vincent, Seychelles, Sierra Leone, Singapore, Solomon Islands, Sri Lanka, Swaziland, Tanzania, Tonga, Trinidad and Tobago, Tuvalu, Uganda, United Kingdom, Vanuatu, Western Samoa, Zambia and Zimbabwe.

CHOGM—Commonwealth Heads Of Governments Meet has become an important international event. India hosted the Summit in 1983 when Prime Minister Indira Gandhi presided over the deliberations. The Summit at Nassau, Bahamas, in October 1985 urged the super-powers to achieve their objectives of preventing an arms race in space and terminating it on the Earth. "In the world of today and tomorrow, international co-operation is not an option, but a necessity"—the Meet declared.

Canada will host the next Summit in 1987.

Headquarters: Marlborough House, Pall Mall, London, SW 1Y 5HX.

Secretary General: Shridath S. Ramphal (Guyana).

Council of Europe: In 1948 the 'Congress of Europe', bringing together at The Hague nearly 1,000 influential Europeans from 26 countries, called for the creation of united Europe, including a European Assembly. This proposal, examined first by the Ministerial Council of the Brussels Treaty Organization, then by a conference of ambassadors, was at the origin of the Council of Europe, which is, with its 21 member States, the widest organization bringing together all European democracies.

The Statute of the Council was signed at London on 5 May 1949 and came into force 2 months later. The founder members were Belgium, Denmark, France, Ireland, Italy, Luxembourg, the Netherlands, Norway, Sweden and the UK. Turkey and Greece joined in 1949, Iceland in 1950, the Federal Republic of Germany in 1951 (having been an associate since 1950), Austria in 1956, Cyprus in 1961, Switzerland in 1963, Malta in 1965, Portugal in 1976, Spain in 1977 and Liechtenstein in 1978.

Headquarters: Palais de l'Europe, 67006, Strasbourg, Cedex, France.

Secretary General: Marcelino Oreja Aguirre (Spain).

COMECON—Council for Mutual Economic Assistance. Founder members are USSR, Bulgaria, Czechoslovakia, Hungary, Poland and Romania. Later admissions were Albania (1949, ceased participation 1961), German Democratic Republic (1950), Mongolia (1962), Cuba (1972), Vietnam (1978). In 1964 Yugoslavia concluded an agreement with CMEA whereby Yugoslavia would participate in the work of some CMEA bodies (at present 21). Afghanistan, Angola, Ethiopia, Laos, Mexico, Mozambique, Nicaragua and the People's Democratic Republic of Yemen attend CMEA sessions as observers.

Headquarters: Prospekt Kalinina, 56, Moscow, G-205.

Secretary: V.V. Sychev (appointed 1983).

ECSC—The European Coal and Steel Community was created in pursuance of a treaty signed by six countries of Europe, in Paris in 1951. The countries were: France, Belgium, the Netherlands, Luxembourg, Federal Republic of Germany and Italy. The treaty affirmed a closer political union of the six countries and created a common market for coal, iron and steel.

The EEC—The European Economic Community, commonly known as the ECM—European Common Market, was brought into existence by the Treaty of Rome of March 25, 1957, signed by the six countries of ECSC—France, Belgium, the Netherlands, Luxembourg, Federal Republic of Germany and Italy. Later Britain, Ireland, Denmark and Norway signed the treaty of accession, but Norway withdrew. With Greece, Spain and Portugal joining lately the EEC now has a membership of 12 countries.

EEC has become the world's largest and most prosperous trading area, with a population of 320 millions—larger than that of any superpower.

The Treaty of Rome guarantees certain rights to the citizens of all member States (e.g. the outlawing of economic discrimination by nationality, and equal pay for equal work as between men and women) and sets out certain other areas where secondary legislation is to fill in the details.

EFTA—*European Free Trade Association* was formed in 1960, as the result of a convention signed by seven countries of Europe at Stockholm. The countries were UK, Austria, Denmark, Norway, Sweden, Switzerland and Portugal. This Association was formed on the pattern of the EEC and has the same objectives. The seven countries who formed the EFTA were generally called the Outer Seven, in contradistinction to the six countries of the EEC, who were called the Inner Six.

Headquarters: Brussels.

The European Free Trade Area (see EEC) has provided common ground for economic co-operation among fifteen European countries—Belgium, France, Germany (West), Italy, Luxembourg, the Netherlands (original six of EEC), Denmark, Ireland, UK (who joined the ECC in 1972), Austria, Iceland, Norway, Portugal, Sweden and Switzerland (the remaining members of the EFTA).

EURATOM—The European Atomic Energy Community was formed in pursuance of a treaty signed in Rome in 1957 by the six countries who formed the ECSC and the EEC. The work of the EURATOM is controlled by the same organs as those of the EEC. But the executive powers are vested in a commission of 5 members nominated by the Council of Ministers and advised by a Scientific and Technical Committee of 20 members and an Economic and Social Committee of 101 members. All major decisions are, however, taken by the Council of Ministers which is formed of one minister from each member state. The object of the EURATOM is the development of nuclear energy for peaceful purposes.

Headquarters: Brussels, Belgium.

The European Parliament is composed of 142 parliamentary representatives from the six countries of Europe who are signatories to the Treaty of Paris (1951) which formed the ECSC and the Treaty of Rome (1957) which formed the EEC and the EURATOM. The delegates to the parliament are elected by the respective legislatures of the member countries in fixed proportions.

Headquarters: Luxembourg.

ESRO—The European Space Research Organisation was formally established in 1964 to promote collaboration among Euro-

pean States, in space research and technology exclusively for peaceful purposes. The members are Belgium, Denmark, France, West Germany, Italy, the Netherlands, Spain, Sweden, Switzerland and UK. Austria, Ireland and Norway participate as observers.

Headquarters: Paris, France.

The French Community is an organisation like the British Commonwealth. It offers to the French overseas territories, which manifest their will to adhere to it, new institutions based on the common idea of liberty, equality and fraternity and conceived with a view to their democratic evolution. This principle was accepted and promulgated by the Constitution of the (Fifth) French Republic which came into force in 1953.

Independent members of the Community are: 1. French Republic, 2. Central African Republic, 3. Republic of Congo, 4. Gabon, 5. Senegal, 6. Chad, 7. Madagascar, 8. Djibouti.

IATA—The International Air Transport Association was founded in 1945 to promote safe, regular and economical air transport and to provide a forum for collaboration. At present there are 40 international airlines (active members) and 19 domestic airlines (associate members).

The Annual General Meeting is the ultimate authority in the Association. The Executive Committee consists of 18 elected members. **Headquarters:** Montreal, Canada and Geneva, Switzerland.

NATO—The North Atlantic Treaty Organisation. In 1949 the foreign ministers of Belgium, France, Luxembourg, the Netherlands, UK, Canada, Denmark, Iceland, Italy, Norway, Portugal and USA met in Washington and signed the North Atlantic Treaty. Greece and Turkey joined the Treaty in 1951, the Federal Republic of Germany in 1955 and Spain in 1982. Thus NATO is an organisation made up of 13 European states, two American states (Canada and USA) and an Asiatic state (Turkey).

The Council is the supreme body of the NATO. It consists of the ministers of member states. The Secretary General is appointed by and responsible to the Council.

Headquarters: Brussels, Belgium.

Secretary General: Lord Carrington (UK).

OAS—The Organisation of American States. The Charter of the OAS was adopted in April

1948, at the ninth International Conference of American States at Bogota, Colombia. The OAS has absorbed previous inter-American organisations like the Pan American Union. The OAS is practically a regional agency of UNO in the western hemisphere and is intended to promote mutual understanding and help among American countries.

Twenty-two American countries are members of the organisation, with equal rights, each country possessing one vote. The members are: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay, Trinidad and Tobago, Venezuela and USA. In Jan. 1962 Cuba was excluded from the OAS at a special meeting held at Punta del Este, Uruguay.

Headquarters: Washington DC., USA.

Secretary General: Joao Clemente Baena Soares.

OAU—The organisation of African Unity came into being in May 1963, when the heads of 30 African States met at Addis Ababa and signed a charter establishing a common organisation for all African states.

Its chief objects are unity and solidarity among African States, elimination of colonialism and defence of the independence of member states. The supreme body in the OAU is the Conference of Heads of States or Governments. The official languages of the organisation are French and English in addition to all the native African Languages.

The organisation has 50 member-states (1984).

Headquarters: African Unity House, Addis Ababa, Ethiopia. Chairman: Mengistu Haile Mariam (Ethiopia). **Secretary-General:** Dr. Peter U. Onu (Nigeria).

OECD—The Organisation for Economic Co-operation and Development was formed in 1961 to replace the Organisation for European Economic Co-operation (OEEC) which was started immediately after the Second World War for the reconstruction of war-ravaged European states. The OEEC was formed in response to an offer of aid from the US Secretary of State Marshall. This aid, since called the Marshall Aid, was to be used to rehabilitate the economies of European

states ruined by the war. A conference of European states was held in Paris in 1948 to accept the proposal.

The OEEC changed its name in 1961 as OECD. The change indicates the altered status of the organisation. It is no longer a purely European organisation. USA and Canada have joined it as full members.

Headquarters: Paris, France. **Members:** 24.

OPEC—The Organisation of petroleum Exporting Countries was the culmination of a long drawn out tug of war between international oil companies and the petroleum exporting countries. Most of these companies were gigantic cartels controlling production in more than one state. It was in their option to increase or reduce petroleum production in various countries and to manipulate prices. Very often they played one producing country against another by adopting various devices that affected the economy of the producing states without reducing the companies' profits.

The immediate provocation for the formation of the OPEC was provided by the announcement of oil companies that they were reducing the prices of Middle East crude. This meant that the countries concerned would be losing proportionately. A conference called together at Baghdad in 1962 decided to form the OPEC. This conference was attended by the representatives of Iraq, Kuwait, Saudi Arabia (Arab Muslim states), Iran, a non-Arab but Muslim state, and Venezuela, a non-Arab, non-Muslim state in far away South America. These countries at that time controlled 80 per cent of the world oil trade.

Membership (1981). Algeria, Ecuador, Gabon, Indonesia, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, United Arab Emirates and Venezuela. Membership is open to any other country having substantial net exports of crude petroleum, which has fundamentally similar interests to those of member countries.

OPEC Fund: The Fund was established in 1976 to provide financial aid to developing countries, other than OPEC members, on advantageous terms.

Headquarters: Obere Donaustasse 93, A-1020 Vienna, Austria.

Acting Secretary-General: Dr Fadhil JIAl-Chalabi (Iraq).

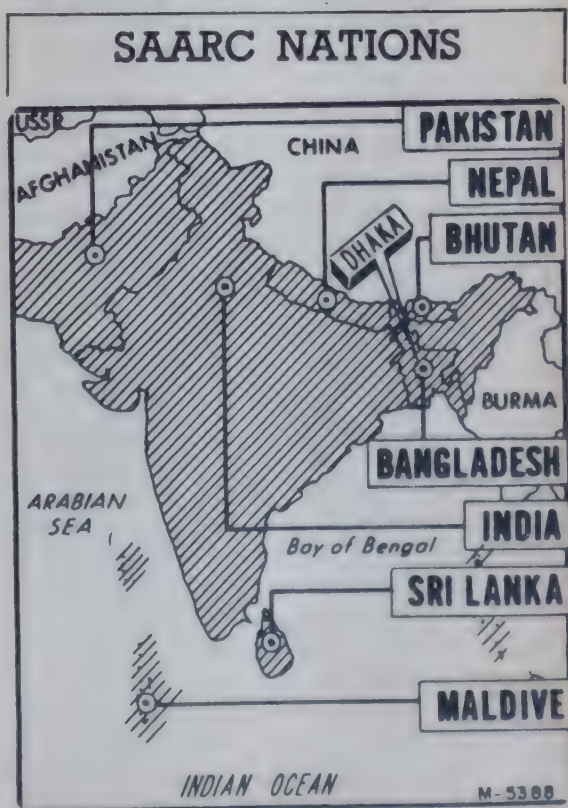
SAARC—South Asian Association for Regional Co-operation is world's newest international organisation. Launched in December in Dhaka, SAARC comprises India, Maldives, Pakistan, Bangladesh, Sri Lanka, Bhutan and Nepal.

SAARC aims at promoting technical, cultural and economic co-operation in South Asia.

The SAARC Charter was signed by 7 countries in the first Summit meeting of their leaders at Dhaka on Dec. 8, 1985. Those who put the signatures were P.M. Rajiv Gandhi (India); President Zia-ul-Haq (Pakistan); President Maumoon Abdul Gayoom (Maldives); King Birendra Bir Vikram Sha Dev (Nepal); Jigme Singye Wangchuk (Bhutan); President J. R. Jayawardene (Sri Lanka) and President Lt. Gen. H. M. Ershad (Bangladesh) who was the Summit Chairman.

The 1986 Summit will be held in New Delhi and Thimpu will host the 1987 one.

The Warsaw Pact. On 14 May 1955 the USSR, Albania, Bulgaria, Czechoslovakia, the German Democratic Republic, Hungary, Poland and Romania signed, in Warsaw, a 20-year treaty of friendship and collaboration, after the USSR had (on 7 May) annulled



the 20-year treaties of alliance with the UK (1942) and France (1944). This was renewed for another term.

It is estimated (1981) that the armed forces of the Warsaw Pact countries total 4.82 m., including 3.71 m. Russians, compared with 4.99 m. NATO forces.

From 1962 Albania was no longer invited to the Warsaw Pact meetings although not formally expelled.

Two Soviet divisions are stationed in Poland, 20 divisions in German Democratic Republic, 4 divisions in Hungary and 5 in Czechoslovakia.

Headquarters: Moscow, USSR.

WCC—The World Council of Churches was formally constituted on 23 Aug. 1948, at Amsterdam, by an assembly representing

147 Churches from 44 countries. By 1984 the member Churches numbered over 300, from more than 100 countries.

The World Council was founded by the coming together of several diverse Christian movements. On 13 May 1938 at Utrecht a provisional committee was appointed to prepare for the formation of a World Council of Churches. It was under the chairmanship of William Temple, then Archbishop of York.

Presidium: Dr. Marga Buhrig (Switzerland), Most Rev. W. P. K. Makhulu (Botswana), Dame R. Nita Barrow (Barbados), Bishop Johannes Hempel (German Democratic Republic), Dr. Lois Wilson (Canada), *Metropolitan Paulos Mar Gregorios (India)*, Patriarch Ignatios IV (Syria).

Office: PO Box 66, 150 route de Ferney, 1211 Geneva 20, Switzerland.

73. NON-ALIGNED MOVEMENT

NAM—The Non-Aligned Movement is exactly what its name implies—a movement rather than an organisation. Having brought together 119 nations, "it has become the biggest peace-movement in the world", says India's Prime Minister Rajiv Gandhi. Almost all the developing countries are members of the Movement.

Jawaharlal Nehru, former Prime Minister of India had been its first and greatest apostle. As early as March 1947, Nehru said, "For too long, we of Asia have been petitioners in western courts and chancelleries. That story must now belong to the past. We propose to stand on our own feet We do not intend to be playthings of others."

Free From the Yoke. Here is the background that led to the formation of the Non-Aligned Movement. After the second world war, the USSR and the USA emerged as superpowers. Meanwhile colonial imperialism also started to recede. India and Burma became independent in 1947. Indonesia followed suit in 1949. In Africa many big countries threw off the colonial yoke. Lesser countries in Africa, Asia and the Pacific also became independent one after the other.

The superpowers tried to win over as many new States as possible to one or the other of them. This attempt brought in what has been called a 'cold war' between USSR,

which championed the socialist countries and USA who posed as the leader of free democracies. It is against this cold bleak atmosphere that Nehru put forth his idea of non-alignment.

Asian Initiative. A conference of likeminded Asian countries became the forum for the birth of the movement. The conference at Bandung (Indonesia) in April 1955 opened the era of a common agreement among all Asian nations to keep aloof from international complications and to settle matters among themselves on certain principles. The principles adopted at the Bandung Conference were later known collectively as *Panch Sheel*. They were: (i) *Mutual respect for each other's territorial integrity and sovereignty*, (ii) *Mutual non-aggression*, (iii) *Mutual non-interference in each other's affairs*, (iv) *Equality and mutual benefit* and (v) *Peaceful co-existence*.

The ideals propounded at Bandung were given a practical shape at Brioni in Yugosla-

via at a meeting of Nehru (India), Marshal Tito (Yugoslavia) and Col. Nasser (Egypt) in July 1956. In pursuance of the decisions taken at this informal meeting of the three great leaders, the first Summit Meeting of the Non-aligned countries took place at Belgrade (Yugoslavia) in Sept. 1961.

The growth of the Movement was phenomenal. From a mere 25 countries who joined the Belgrade summit (1961) the number had increased to 101 at the Delhi summit (1983). It rose to 119 by September, 1985 when the Non-Aligned Foreign Ministers met to decide on the venue of the 8th Summit in 1986.

The basic principle of non-alignment was explained by Nehru thus: "...we propose as far as possible to keep away from power blocs of groups aligned against each other....we propose to keep on the closest terms of friendship with all countries, unless they themselves create difficulties. We shall be friends of America and intend co-operating with them. We intend also to co-operate fully with the Soviet Union."

First Summit, Belgrade: September, 1961. Participants: 25 heads of state and government who were full members. Observers: three.

The conveners of this essentially *ad hoc* conference little thought that they were setting a pattern for convening summits, every three years. President Tito in his inaugural address categorically stressed that the countries had no wish to form any kind of third bloc.

Second Summit, Cairo: October, 1964: Full members: 47 countries. Observers: 10.

The Cairo declaration represented a compromise between the moderates and the militants. Its preamble recognises "peaceful coexistence as the only way to strengthen peace based on universal freedom, equality and justice", but warns that it "cannot fully materialise throughout the world without the abolition of imperialism, colonialism and neocolonialism."

Third Summit, Lusaka: September, 1970: Members: 54. Observers: 11.

The tussle between the "moderates" like Nehru and Tito and the "militants" like Sukarno and Nkrumah was evident right from the start. Nehru stressed the imminent and

ominous threat of a war between the super-powers and held that all other issues including the elimination of colonialism must take second place.

The militants, despite the fact that on the opening day of the conference the Russians resumed their nuclear tests, attacked Nehru for being an "internationalist" and not concerned enough with the more vital problems of decolonisation and imperialism.

Fourth Summit, Algiers, September, 1973: Full members: 74. Observers: 12.

With the growth of detente the concern for the defusion of tension between the super-powers was almost forgotten. Instead, the members stressed that peace was indivisible and should not be reduced to merely shifting the point of confrontation from one area to another. Sources of tension would remain till the elimination of colonialism, foreign domination, occupation, neo-colonialism, apartheid and Zionism, the declaration said. Condemnation of Zionism as a form of fascism, entered into the non-aligned vocabulary at this summit.

Fifth Summit, Colombo, August, 1976: Full members: 86. Observers: 22. Guests: seven.

The fifth summit in response to the central concern of the host country, Sri Lanka, laid great emphasis on the dismantling of military bases in the Indian Ocean and especially the expansion of the US naval base of Diego Garcia.

Sixth Summit, Havana, September, 1979: Delegates: 94 (Although 96 countries were supposed to attend, Saudi Arabia and Kampuchea did not).

President Castro in his inaugural address attempted to swing the movement towards the Soviets. Cuba, in its draft declaration, had advocated cooperation with the Socialist countries in "their determined battle against the forces of imperialism".

India and Yugoslavia were, however, able to work out a less provocative formula which acknowledged the cooperation received by the non-aligned countries from other "peace, freedom and justice-loving democratic and progressive states." Alarmed at Cuba's efforts to "tilt" the movement, Burma demanded that the movement dissolve itself and make a fresh start.

There was also a bitter controversy over the efforts by hardline Arab states to expel Egypt from the movement. The move by the "brutal minority" was, however, resisted by 15 largely pro-Western African states.

On the Kampuchean seat, members were also sharply divided and their failure to arrive at a consensus on which government should represent Kampuchea persuaded the summit leaders to keep the seat vacant.

Pakistan participated as a full member at the sixth summit for the first time. General Zia's speech was noticeable for his warm praise of China. He also defended his country's right to use nuclear energy for peaceful purposes.

Seventh Summit, Delhi, March 1983: Full members: 99. Observers: 26.

The Delhi summit was a landmark in the history of the Non-Aligned Movement. Pres-

ided over by Mrs. Indira Gandhi, as the Prime Minister of the host country, it was attended by 99 members out of 101. St. Lucia was not present, while the seat of Kampuchea remained vacant.

While the summit reiterated the oft-repeated demands of the non-aligned countries, it took two specific decisions, namely to demand the evacuation of foreign presence from Afghanistan and to keep the seat of Kampuchea vacant, till a consensus emerged.

The Non-Aligned Movement will celebrate the 25th anniversary of its formation in 1986. The Foreign Ministers meeting at Luanda, Angola in September, 1985 elected Robert Mugabe, Prime Minister of Zimbabwe, to the Chairmanship of the Movement. Harare, capital of Zimbabwe, will host the Summit.

74. THE GENEVA SUMMIT

The Super Power Summit between US President Ronald Reagan and Soviet leader Mikhail Gorbachev staged at Geneva in November '85 is historic in many respects. It was a meeting of super power leaders after 6½ years.

Despite forebodings of failure it ended with a ringing pledge not to fight either nuclear or conventional war between them in view of their "catastrophic consequences" to the world at large.

Though the summit produced no arms reduction agreement as such, their declaration of intent on reduction of tension on this count and continuation of dialogue was a bold step forward. *It was evident that the unrelenting stand of the US on the continuation of Star Wars research and development was the stumbling block of a concrete agreement at Geneva.*

(See Cover Feature on Star Wars)

Minor Agreements. Pledging not to fight either a nuclear or a conventional war that would have catastrophic consequences for the world at large, both the United States and the Soviet Union have agreed to step up mutual consultations on matters of international and bilateral concern and proceeded to sign relatively minor agreements pertain-

ing to civil aviation, environmental protection and research on thermonuclear fusion for peaceful purposes.

Although there were those who were trying to remove any excessive optimism about the summit, what fuelled speculation that the two leaders would go beyond a statement of intent was the flurry of proposals and counter-proposals in the last few weeks before the actual Summit. Responding to the Soviet Union's 50 per cent across the board cut in offensive nuclear charges, the United States came up with its version of a reduction in nuclear warheads; and then there was the willingness on the part of Moscow to accept a limited number of American cruise missiles in Europe thereby giving rise to the feeling that the two countries might be able to forge a deal on the question of medium range missiles.

While the unusually long and cordial talks between Reagan and Gorbachev have sent the clear signal that the two sides are looking for a qualitative change in bilateral relations,

the summit also revealed that substantial disagreements do exist not only over arms control but on regional matters as well. Even as the joint statement released at the end of the talks makes no mention of regional issues, the two leaders spent considerable time on trying to find a way to break the impasse on Afghanistan.

Step Forward. Although the Geneva summit may have produced no specific accord on nuclear arms, it has nevertheless been viewed as a first step towards the improvement of bilateral ties, leading to the easing of tensions in the international system.

While the leaders of the *Warsaw Pact* countries agreed that it has created more favourable opportunities for improving the international situation and for a return to detente.

America's NATO allies have viewed it as a significant success that could lead to progress in global arms reductions, and in this context are looking for an early agreement on the question of medium range missiles. Even though the summit might have created a better atmosphere for the two negotiating teams when they begin their arms limitation deliberations in 1986, the prospects of an imminent breakthrough still seem distant as

Superpower nuclear balance-sheet

	United States	Soviet Union
Intercontinental ballistic missiles (ICBMs) and submarine launched ballistic missiles (SLBMs)	1,630 (1,030 ICBMs and 630 SLBMs)	2,352 (1,398 ICBMs and 954 SLBMs)
ICBM and SLBM warheads	7,506 (2,130 ICBMs and 5,376 SLBMs)	8,830 (6,420 ICBMs and 2,410 SLBMs)
Heavy bombers	263	480 (includes 300 backfire bombers.)
Air-launched Cruise missiles	1,176	200
Missile throw weight that could be lifted off and taken to target	4.4 million pounds	11.9 million pounds
Medium-range launchers	134 Pershing 2S and ground launched Cruise missiles (single warhead)	270 SS-20s in Europe plus 171 in Asia for a total of 441 (three warheads each)
Medium-range bombers	254	553 (including backfire bombers).

the two countries are yet to agree on what constitutes a comprehensive package.

The hawks in the United States might be happy over the fact that Reagan has not relented on his Strategic Defence Initiative, but the recent outcome at Geneva has underlined the fact that it is this programme that is standing in the way of a meaningful accord. If officials in the Reagan administration insist that the summit has in no way altered the stance on the SDI, Gorbachev has once more reiterated that only if the US gave up its quest for space-based weapons systems, would he be willing to initial an arms

agreement. He has asserted that the Soviet Union was capable of matching the US technologically in the development of space-based systems. If after the Geneva summit a new framework for bilateral relations between the big powers can be devised the meetings scheduled for 1986 and 1987 could pave the way for concrete understandings.

Joint Statement. The following is the text of the joint statement issued by Reagan and Gorbachev, at the conclusion of the two-day summit.

● By mutual agreement, the President of the United States, Ronald Reagan and the Gener-

al Secretary of the Central Committee of the Communist Party of the Soviet Union, Mikhail Gorbachev, met in Geneva during November 19-21

● These comprehensive discussions covered the basic questions of U.S.-Soviet relations and the current international situation. The meetings were frank and useful. Serious differences remain on a number of critical issues.

● While acknowledging the differences in their systems and approaches to international issues, some greater understanding of each side's view was achieved by the two leaders. They agreed about the need to improve U.S.-Soviet relations and the international situation as a whole.

● In this connection the two sides have confirmed the importance of an ongoing dialogue, reflecting their strong desire to seek common ground on existing problems.

● They agreed to meet again in the nearest future. The General Secretary accepted an invitation by the President of the United States to visit the United States and the President of the United States accepted an invitation by the General Secretary of the Central Committee of the CPSU to visit the Soviet Union. Arrangements for and timing of the visits will be agreed upon through diplomatic channels.

● In their meetings, agreement was reached on a number of specific issues. Areas of agreement are registered on the following.

● The two sides, having discussed key security issues, and conscious of the special responsibility of the USSR and the U.S. for maintaining peace, have agreed that a nuclear war cannot be won and must never be fought. Recognising that any conflict between the USSR and the U.S. could have catastrophic consequences, they emphasised the importance of preventing any war between them, whether nuclear or conventional. They will not seek to achieve military superiority

● The President and the General Secretary discussed the negotiations on nuclear and space arms

● They agreed to accelerate the work at these negotiations, with a view to accomplishing the tasks set down in the joint

What They Achieved

Following are the highlights of the Reagan-Gorbachev summit meeting at Geneva in November, 1985.

Arms Control: *The two leaders agreed to accelerate the arms control negotiations, which are set to resume on Jan. 16 in Geneva.*

Future Meetings: *The leaders announced that they would meet at two additional summit sessions—one next year in the United States and another in 1987 in the Soviet Union, according to U.S. officials. They agreed to the additional meetings on Wednesday, the last day of the Geneva session, after a dinner at President Ronald Reagan's residence.*

Cultural Issues: *The two sides reached a solid accord to resume U.S.-Soviet cultural exchanges. The agreement was signed during the closing ceremony by Secretary of State George P. Shultz and Foreign Minister Eduard A. Shevardnadze.*

Exchanges of performers, students, teachers and scientists were sharply curtailed by former President Jimmy Carter in retaliation for the Soviet intervention in Afghanistan in 1979.

Air safety: *The United States and the Soviet Union also agreed to establish new communication links to improve air safety in the North Pacific to avoid incidents such as the Soviet downing of a South Korean jetliner two years ago.*

Consulates: *A separate agreement cleared the way for a new U.S. consulate in Kiev and a Soviet consulate in New York. It also authorized the two governments to conclude negotiations to resume commercial air travel between the United States and Soviet Union.*

Research: *Another agreement aimed to foster research on the sun as energy through transfers of technology and "basic knowledge."*

U.S.-Soviet agreement of January 8, 1985, namely to prevent an arms race in space and to terminate it on earth, to limit and reduce nuclear arms and enhance strategic stability.

The 15th Summit

The meeting of President Reagan and Soviet leader Gorbachev in Geneva on 19th and 20th November 1985 is the 15th Superpower Summit in 30 years.

Here is a sum-up of the Summit meetings to date:

- **1943: Teheran** Franklin Delano Roosevelt, Winston Churchill and Joseph Stalin confer on the war and military strategy.
- **1945: Yalta** Roosevelt and Churchill join Stalin to map out the postwar borders of Eastern Europe. Stalin promises free and unfettered elections in Poland. The three agree on zones of occupation in Germany and Austria.
- **1945: Potsdam** Harry Truman, Churchill and Stalin meet outside Berlin following Germany's unconditional surrender. Poland receives part of East Prussia and its western border is extended to the Oder and Neisse rivers. The four zones are established. The Allies' mandate includes demilitarization, denazification and democratization.
- **1955: Geneva**
The Big Four tackle topics from the reunification of Germany to disarmament. They do not reach agreement, but the atmosphere of good will—later called the "Spirit of Geneva"—is striking.
- **1959: Camp David** Nikita Khrushchev, the first Soviet leader to visit the United States, pays a call on Dwight Eisenhower. Nothing significant is accomplished, but the talks—on topics ranging from Berlin to South East Asia—are congenial and relaxed.
- **1960: Paris** Khrushchev walks out, furious at Eisenhower's refusal to apologize for U-2 flights over the Soviet Union.
- **1961: Vienna** Khrushchev and John F. Kennedy exchange views on nuclear

testing and their support for a neutral Laos. Khrushchev comes away feeling that Kennedy is soft. The following year, a Soviet offensive build-up in Cuba risks triggering nuclear war.

- **1967: Glassboro, N.J.** Soviet Prime Minister Aleksei Kosygin and Lyndon Johnson rendezvous at Glassboro State College. The two discuss the Arab-Israeli war, Vietnam and nuclear proliferation—but decide nothing.
- **1972: Moscow** Inaugurating a new era of detente, Richard Nixon becomes the first U.S. President to visit the Soviet capital. He and Leonid Brezhnev wrap up round one of SALT with the signing of an ABM treaty and an interim agreement on strategic offensive arms.
- **1973: Washington** In six days, Brezhnev and Nixon initial nine agreements ranging from a pact to prevent nuclear war to accords on cultural exchanges and agriculture.
- **1974: Moscow** Nixon meets Brezhnev in the Kremlin again, this time to sign a protocol limiting the deployment of ABM systems.
- **1974: Valadivostok** Brezhnev and Gerald Ford produce tentative principles for SALT II—including equivalence in delivery systems—to be effective through 1985.
- **1975: Helsinki** Brezhnev and Ford reconvene in Helsinki for private talks. Later, 35 nations sign a non-binding pact on security, economic cooperation and human rights.
- **1979: Vienna** Brezhnev and Jimmy Carter sign SALT II in Vienna. Six months later Soviet troops invade Afghanistan. As a result, ratification of the treaty by the U.S. Senate is postponed indefinitely.

(Source: 'Newsweek', Nov. 25, 1985)

● Noting the proposals recently tabled by the U.S. and the Soviet Union, they called for early progress, in particular, in areas where there is common ground, including the principle of 50 per cent reductions in the nuclear arms of the U.S. and the USSR appropriately applied, as well as the idea of an interim INF agreement.

● During the negotiation of these agreements, effective measures for verification of compliance with obligations assumed will be agreed upon.

● The sides agreed to study the question at the expert level of centres to reduce nuclear

risk taking into account the issues and developments in the Geneva negotiations. They took satisfaction in such recent steps in this direction as the modernisation of the Soviet-U.S. hotline.

● Gorbachev and Reagan reaffirmed the commitment of the USSR and the U.S. to the treaty on the non-proliferation of nuclear weapons and their interest in strengthening together with other countries the non-proliferation regime, and in further enhancing the effectiveness of the treaty, *inter alia* by enlarging its membership.

Forty years after Hiroshima

Mankind has completed 4 decades living under the shadow of nuclear warheads. Haunting memories of Hiroshima, where the first atom bomb was dropped, revisited the world after 40 years.

Thousands of people filed past the Memorials at Hiroshima and Nagasaki in Japan in September 1985 to lay bouquets of flowers in emotional greeting of martyrs of the first ever nuclear holocaust.

First experimental atomic explosion at Alamogordo, New Mexico was on July 16, 1945. The bomb that devastated the Japanese city of Hiroshima was dropped on Aug. 6, 1945 and Nagasaki was reduced to rubble by another bomb, three days later. An estimated 91000 people are believed to have died in Hiroshima alone.

The little girl looked up and saw the plane. She waved and said, 'Hi, Angel'. Just then a white speck appeared in the sky. Forty-three seconds later, her family, a friend across the lane she was talking to, and thousands of other men, women and children lay dead, or dying. Her beautiful city had instantly turned into an inferno. All that the pilot of the bomber could see was "a blanket of tar, smoke, debris, bubbling, just boiling."

The invention of the atom bomb that destroyed Hiroshima, 40 years ago was described by an American Scientist at the time as a "drama greater than the birth of Christ". It made the Japanese surrender (though many people believe they were about to surrender anyway) and formally ended the Second World War. But it did much else.

Scientists have visualised that in the event of a universal nuclear war, 90 per cent of the 10,000 megaton bombs would explode over Europe, Asia and North America and the remaining over Africa, Latin America and Oceania.

Half of these bombs they say will be exploded in the air and the rest half on Earth's surface. Explosions on the Earth will involve cities with population of more than 60,000.

Estimates show that as a result of this war, some 1,500 million will die and 1,100 million will be wounded.

Disclosing the conclusions of a study made in the United States, astronomer Carl Sagan told the Soviet weekly "Moskovskie Novosti" that this war would mean destruction of Earth's civilisation and all life.

75. INTERNATIONAL HOTSPOTS

Among the hotspots that attracted international attention in 1985 were Sri Lanka, South Africa, the Gulf, Lebanon and Afghanistan. While the crisis continued in Sri Lanka in spite of negotiations, confrontation in South Africa reached boiling point. The war between Iran and Iraq went on unabated for the 5th year. Lebanon completed a decade of fighting. And in Afghanistan it appeared that Russia was loosening its hold.

Ethnic crisis in Sri Lanka continued as the second phase of talks between the Government and Tamil Organisation broke down in Thumpu, Bhutan on Aug. 17, 1985.

Sri Lanka Crisis Representatives of Liberation Tigers for Tamil Eelam (LTTE), Tamil Eelam Liberation Organisation (TELO), Eelam Peoples Revolutionary Organisation (EROS), Peoples Liberation Organisation of Tamil Eelam (PLOTE), and Tamil United Liberation Front (TULF) walked out protesting against massacre of Tamils in Vavunia and Trincomalee. The first four of these organisations belong to a united movement— Eelam National Liberation Front (ENLF).

In the first phase of talks, the Sri Lankan delegation repeated proposals for limited local autonomy for Tamils which the Tamils had rejected in Dec. 1984. It was the intervention of Romesh Bhandari, the Indian Foreign Secretary, which prevented the first round talks from collapsing.

Tamils have been putting forth a 4-fold demand:

1. Recognition of a separate national identity of the Tamils.
2. Respect for the integrity of the traditional Tamil homeland.
3. Recognition of the right to self-determination and
4. Citizenship right to all Tamils who had chosen to make Sri Lanka their homeland

The stand of the Government of India was made clear by Prime Minister Mr. Rajiv Gandhi in the Cabinet meeting when he said that he opposed independence for the Tamils and that solution to the ethnic prob-

lems should fall within the constitution of Sri Lanka. Even after the announcing of ceasefire on June 18, 1985, clashes have been reported especially from the Districts of Vavunia and Trincomalee. Over 300 civilians are reported to have been either killed or missing and about 1 lakh rendered homeless. The number of security personnel killed is around 20.

The killing of the Sinhalese soldiers in Jaffna in July 1983 by Tamil militants caused the biggest blood bath in the post independence era, resulting in the death of thousands of Tamils living in the South. Since then the number of Tamils living outside the northern and eastern provinces are estimated to have dropped by about 1/3 the 1983 figure of 510000 through migration northwards and abroad including India. The media have been playing down action of the security forces.

Major ethnic groups: Sri Lanka's population contains four major ethnic groups in a population of 14,900,000 (1981 census).

Sinhalese	11,000,000	74%
Sri Lanka Tamils	1,870,000	12.6%
Muslims	1,200,000	4.40%
Indian Tamils	825,000	5.6%
Burghers	38,236	.26%

The majority of the Sinhalese are Budhists; the majority of the two Tamils groups are Hindus

South Africa 1985 saw an intensification of the struggle by the black majority South Africans (over 16 millions) against the racist rule by the white minority of 4.5 millions. The struggle won wide support in international forums including the United Nations, the Commonwealth and the Non-

Aligned movement. The attitude of U.S. government also mellowed down in favour of the black people.

Reagan administration initially stuck to its avowed policy of "constructive engagement" in south Africa, but had to improve upon it as U.S. leaders like Senator Kennedy and Rev. Jesse Jackson by their personal intervention in the issue symbolised a rousing anti-apartheid feeling all over America. There was wide hue and cry in the U.S. impose economic sanctions to pressurize Botha regime.

The all out war started by various black movements since Sept. 1974, with moral support from around the world mounted strong pressure against the Pretoria government led by President Pieter W. Botha. There were many bloody confrontations between the white troops and agitationists in which hundreds of lives were lost.

Nelson Mandela, the freedom fighter languishing in South African jail for the last 20 years on the count of treason was the centre of an awakened nationalistic fervour. Nelson and Mrs. Winnie Mandela were awarded the Third World Foundation Prize for "their vision of a non-racial society and courage and determination as the symbol of the campaign against apartheid."

Nobel Laureate Archbishop Desmond Tutu also was in the fray but he was sorry that "the young blacks appeared determined to destroy apartheid by violence", rejecting his pacifist leadership.

Emergency. In the face of the black struggle spreading wider and stronger, Botha regime declared a state of emergency in 36 districts of the country on July 21, 1985 (withdrawn in 8 districts on Dec.3). The emergency powers were imposed in areas around Johannesburg and in the Eastern Cape after 17 months of noting had claimed more than 500 lives, claimed the government. But this unleashed a wave of protest from all over the world. France led Western Europe in imposing sanctions against the racist regime.

The white rulers, intermittent efforts to stem the tide against minority rule resulted in setting up of black ruled Bantustan Homelands in Transkei, Bophuthatswana, Ciskei and Venda and a tri-cameral parliament with

separate chambers for the white, the Indians and the coloured. The government legalized inter-racial marriages and promised rights of ownership of property to blacks by early 1986. The year ended with hopes of a large number of long-term detainees being set free.

India's stand in the freedom struggle has been a continuation of the hoary as when Gandhiji sowed the seeds of nationalism among the blacks almost a century back. India has been strongly supporting the African National Congress which has been banned by South African Government, and she was among the first to give diplomatic recognition to *SWAPO that fights for Namibia's independence from South Africa.

Decline: Foreign investment by western Japanese companies have been a major bulwark of apartheid. With inflation at unprecedentedly high levels (16 per cent) and the rate of profit sharply declining in recent years (average rate of return on investment fell from 18 per cent in 1979 to seven per cent in 1983) there has been a steady flow of capital away from South Africa for a number of years. Since 1980 some thirty American companies have wound up their South African operations.

The mass upsurge has greatly exacerbated the situation. The exchange rate of the Rand has sharply declined vis-s-vis the dollar, foreign banks are calling in their loans which have accumulated to dangerous levels; and the price of gold is down, which means less foreign exchange earnings for Pretoria to offset the growing budget deficit caused by over-spending on the military. South Africa is no longer the "investor's paradise" where profits are great and problems small.

Sweden and Norway imposed economic sanctions on December 17, 1985.

Gulf War Going On Over five year have elapsed since Iran-Iraq war breakout. The intricacies of the long standing interfactional feud, the subtle interference of super powers, the unrelenting attitude of leaders of the two countries have made all efforts to end the fight futile.

It was in September 1980 that Saddam Hussein, President of Iraq, abrogated the

*SWAPO South West African Peoples Organisation. Namibia is the new name for South West Africa.

Algiers pact of 1975 by which his country had been forced to accept joint control of the important Shatt-Al-Arab waterway and invaded Iran. In spite of the initial advancements of Iraq the offensive bogged down. Hopes of an Israeli-style blitzkrieg victory taking advantage of the turmoils in Iran was totally misplaced. In 1981 the Iranians counter attacked and raised the siege of Abadan.

Iran entered into a new offensive in March 1982. By June almost all Iraqi troops had withdrawn from Iranian territory. In July the Iranians mounted a counter attack on Iraq. This was checked but fighting continued despite calls for a ceasefire.

By May 1984 the increased attacks by both sides on shipping in the gulf, threatened a major escalation of the crisis.

In March 1985 the two countries stepped up a wave of artillery and missile attack on civilian targets ignoring international appeals for restraint. Meanwhile Iraq continued attack on 'large naval targets' (merchant vessels and sometimes oil tankers). In the first three months of 1985 they made 36 attacks on Gulf shipping according to their claim.

On Aug. 16, 1985, Iraqi warplanes heavily damaged oil loading facilities on Kharg Island, Iran's main terminal. Kharg handles about 90 per cent of Iran's exports of crude oil. Despite damages tankers continued to load oil at ore jetty on the Island. Iran, meanwhile, said its army penetrated into Iraqi lines about 100 km east of Baghdad and killed or wounded 400 enemy troops.

Moves for Iran-Iraq peace were initiated by Indian Prime Minister Rajiv Gandhi as Chairman of NAM and by Gulf Co-operation Council comprising of Oman, Qatar, Kuwait, Bahrain, Saudi Arabia and U.A.E. Statement issued by the six Arab states said GCC was prepared to undertake any direct endeavour that might bring about progress toward dialogue and negotiations. But no tangible results were seen.

Lebanon Civil strife has entered into its tenth year in the picturesque country on the Mediterranean coast.

Of all the world's fragmented little nations, Lebanon is the most perplexing. Once the home of the Phoenicians it has been overrun by Egyptians, Assyrians, Babylonians, Per-

sians, Greeks, Romans, Arabs, European crusaders and Ottoman Turks. In 1932 when Lebanon was a French mandate, France conducted a national census that showed the Christians with a slight majority.

When Lebanon became independent in 1943 followed by evacuation of French troops three years later the preponderance of political power was apportioned between Maronite Christians and Sunni Muslims on the basis of 1932 head count with a minimal share of representation for such minority groups as the Druze and Shiite Muslims. A higher birth rate among the muslims and the influx of Palestinian guerillas in the early 1930's upset the prevailing balance. The result was the bloody civil war of 1975 and 1976. It left Lebanon vulnerable to the ambitions of Syria.

Whatever fragile balance the Lebanese managed to attain during the following years, was upset by the Israelite invasion of June 1982. From then on it was a series of bloody battles. Israel in its fight to drive out Palestinians and Syrians encountered leftist Druze and Shiite militants. Christian dominated government forces tried to curb muslim faction, French and American peace keeping forces were heavily damaged by leftist and Muslim groups. Meantime, Christian militants aided by Israel attacked unarmed Palestinian refugees in Sabra and Shatila, rival Muslims clashed and in-fights within PLO divided and weakened Yasser Arafat's forces.

Now the Shia Amal movement has adopted a new line calling for union with Syria ruling out any accommodation with the Government of President Amin Gemayel.

The inhabitants of Beirut have attuned themselves to living in the midst of hostilities. Increasing unemployment and price hike of all essential commodities force many youths to join the fighting militants.

Afghanistan The Soviet Union has expressed its willingness to withdraw its 105,000 troops conditionally from Afghanistan. It was made clear in the Soviet leader Gorbachev's meetings with U.S. President, Ronald Reagan and Indian Prime Minister, Rajiv Gandhi.

At the same time the talks between Afghanistan and Pakistan through UN mediator in

Geneva was progressing. On August 29, 1985 after the 5th round of talks, the UN representative, Diego Cordovez, said that the United States and Soviet Union had been asked formally to guarantee to UN peace plan for Afghanistan and both had expressed interest.

The UN proposed 4 point peace plan;

1. Agreement on non-intervention.
2. Agreement on international guarantees for a settlement.

3. Agreement on repatriation of more than 3 million Afghan refugees in Pakistan.
4. Withdrawal of Soviet troops.

Of these, the first and 2nd were complete and the third almost complete. The fourth was under discussion but with the Soviet announcement of its decision to withdraw, the problem seems to be on way to settlement. The Soviet military move into Afghanistan which established the present Government in Kabul, was in December 1979.

76. INDEPENDENT STATES

USSR with 22.4 million sq. km is the biggest independent State in the world while China with 1,051,551,000 people becomes the biggest State in respect of population. Vatican City has the distinction of being the smallest State in respect of area (44 hectares) and population (about 1000 people).

The brief description of States given below deal primarily with location, area, population, currency, history and economy. Population figures have been updated with reference to the latest World Population chart of UNFPA.

Currency rates, though of 1985, are subject to heavy fluctuations as evident from the fledgling economies of some newly independent countries.

Biggest States

In Area

State	Area (sq. km.)	Location
U.S.S.R.	22,402,200	Europe-Asia
Canada	9,976,139	N. America
China	9,596,961	Asia
U.S.A.	9,363,130	N. America
Brazil	8,511,965	S. America
Australia	7,682,300	S. Pacific
India	3,280,483	Asia
Argentina	2,776,889	S. America
Sudan	2,505,813	Africa
Algeria	2,381,741	N. Africa

In Population

China	1,051,551,000	Asia
India	746,742,000	Asia
USSR	275,761,000	Europe-Asia
USA	235,681,000	N. America
Indonesia	162,167,000	Asia
Brazil	132,648,000	S. America
Japan	119,492,000	Asia
Bangladesh	98,464,000	Asia
Pakistan	98,971,000	Asia
Nigeria	92,037,000	Africa

Smallest States

In Area

State	Area (sq. km.)	Location
Vatican City	0.44	Europe
Monaco	1.00	Europe
Nauru	22.00	S. Pacific
Tuvalu	26.00	S. Pacific
San Marino	61.00	Europe
Liechtenstein	157.00	Europe
Maldives	298	Indian Ocean
Malta	316	Mediterranean
Grenada	344	Caribbean
St. Vincent	220	Caribbean

In Population

Vatican City	1,000	Europe
Tuvalu	7,349	S. Pacific
Nauru	8,421	S. Pacific
San Marino	21,622	Europe
Liechtenstein	26,512	Europe
Monaco	27,063	Europe
Andorra	41,627	Europe
Kiribati	60,302	S. Pacific
Seychells	64,718	Indian Ocean
Dominica	6,300,000	Caribbean

Tourists Beware

There have been numerous instances of Indian travellers being sent back from various countries, especially from Western Europe, because of new Visa restrictions.

Indians used to enjoy free access to all Commonwealth countries and West European nations till India decided to impose restrictions on travellers from these countries to stop entry of Sikh terrorists to India.

Reciprocating to this, almost all European nations now insist on visas for all Indian travellers including genuine tourists. Unfortunately this information has not percolated to all the travelling public.

Tourists are advised to doublecheck whether the country of destination has imposed new visa restrictions or not well in advance. The addresses of diplomatic missions in India have been added in the 1986 Year Book primarily with this objective.

AFGHANISTAN

Cap: Kabul; **Area:** 647,497 sq. km.; **Pop.** 14,292,000. **Lang:** Pakhto (Pashtu), Dari, Persian; **Rel:** Islam; **Currency:** Afghani, AFS. 50=US \$1.

Afghanistan, a land-locked republic in Central Asia, is bounded by USSR to the north, Pakistan to the east and south, China to the north-east and Iran to the west. Known originally as Ariana, then as Khorasan (the land of the Rising Sun), Afghanistan was formed as a separate state by Ahmed Shah

Durrani in A.D. 1747. Pro-Soviet Govt. since Dec. 1979 when Soviet troops occupied the country.

Agriculture remains the mainstay of the economy. Sheep-rearing is another main occupation and the chief exports are livestock, fruits, wool and skins. The chief minerals are coal, salt, natural gas, petroleum, iron and copper.

president: Babrak Karmal. **P.M:** Sutan Ali Kihntmand.

Mission in India: Emabssy of Afghanistan, Shanti Path, Chanakyapuri, New Delhi-110 021.

ALBANIA

Cap: Tirana; **Area:** 27,748 sq. km; **Pop:** 29,85,000; **Lang:** Albanian; **Rel:** officially abolished; **Currency:** Lek \$1=9.33 leks.

Albania lies on the west coast of the Balkan peninsula in south-east Europe. It is bordered by Yugoslavia to the north and east, Greece to the south and the Adriatic and Ionian Seas to the west. Albania was first established as an independent state in 1912. Communist Government.

More than 40 per cent of the land is farm-land producing wheat, maize, sugar beet, cotton and tobacco and supporting a heavy livestock population mainly sheep and goats. The important minerals are coal, oil, chrome, copper and nickel. Industries include cotton textiles, woollen fabrics, leather goods, petrol, cement, sugar, beer and cigarettes.

Head of state: Ramiz Alia, **P.M:** Adil Carcani.

ALGERIA

Cap: Algiers; **Area:** 2,381,741 sq. km. **Pop.** 21,272,000. **Lang:** Arabic and French; **Rel:** Islam; **Currency:** Dinar \$1=5.27 DA.

Algeria is an independent republic in North Africa and extends for 640 miles along the shores of the Mediterranean between Tunisia and Libya on the east and Morocco and Mauritania on the west. Mali and Niger are to the south. The plains lying along the coast are very fertile. The Atlas Mountains reaching to altitudes of some 7000 ft. split the country into two. Algeria became an independent republic on July 3, 1962.

Agricultural products include wheat, bar-



ly, potatoes, artichokes, flax and tobacco. Fruits like dates, pomegranates and figs grow in abundance. Wine and olive oil are also produced. Cattle raising, however, is the most important occupation. Important minerals are iron, zinc, mercury, copper, antimony, phosphates and petroleum.

President: Chadli Benjedid, **P.M.:** Abdul Hamid Brahimi.

Mission in India: Embassy of Algeria 13, Sunder Nagar, New Delhi- 110 003.

ANDORRA

Cap: Andorre-la-Vieille; **Area:** 464 sq. km; **Pop:** 41627. **Lang:** Catalan; **Rel:** Christian; **Currency:** (France), Peseta (Spain).

The principality of Andorra, founded in 1278, lies in the valleys of Eastern Pyrenees, between France and Spain, about half-way between Barcelona and Toulouse.

Andorra has no proper constitution and its international status is dubious. It is nominally subject to the suzerainty of France and the Bishop of Urgel in Spain.

The government is carried on by a Council of 28 elected members.

Andorra is an agricultural country, cereals, potatoes and tobacco being the principal crops. Iron, lead, alum, stone and timber are the principal products, though tourism is the main source of income.

Head of Govt: Josef Pintat Solaus. First Syndic: Francesc Cerqueda- Pascuet.

ANGOLA

Cap: Luanda; **Area:** 1,246,699 sq. km; **Pop:** 8,540,000; **Lang:** Portuguese, Bantu; **Rel:** Tribal and Christian; **Currency:** Kwanza \$1=29.92 Kwanza.

Angola, formerly Portuguese West Africa, is bounded by Zaire and Zambia on the north and east and by Botswana and Namibia on the south. The Atlantic lies to the west. Angola became an independent state in 1975.

The important food crops are millet, maize and cassava. The main cash crops are coffee, cotton, oil palm and sisal. Industries comprise textiles; brewing cement, oil refining and sugar. Angola is famous for its gemstones, and produces about one-tenth of the total world supply. The main exports are

crude petroleum, coffee, diamonds, iron ore, fish, sisal and timber.

President: Jose Eduardo dos Santos.

ANTIGUA & BARBUDA

Cap: St John's; **Area:** 280 sq. km; **Pop:** 79,000; **Lang:** English and Patois; **Rel:** Christian; **Currency:** Eastern Caribbean \$ US \$1=EC\$2.70.

Antigua, one of the islands of British West Indies, is politically linked to two islands Barbuda and Redonda. Redonda is uninhabited. Antigua and Barbuda became independent on Nov. 1, 1981.

The population is of mixed European Negro origin. The economy is agricultural. Sugar and sea island cotton are the main exports. Tourism is a major source of income.

Governor-General: Sir Wilfred Ebenezer Jacobs. **P.M.:** Vere C. Bird.

ARGENTINA

Cap: Buenos Aires; **Area:** 2,766,889 sq. km; **Pop:** 30094000; **Lang:** Spanish; **Rel:** Christian; **Currency:** Austrel

Argentina lies at the tip of South America extending for some 2300 miles from Bolivia to Cape Horn. Its maximum width is 930 miles. The highest peak in the Americas, *Aconcagua*, is in Argentina. Argentina became an independent republic in 1810.

Argentina abounds in deposits of coal, lead, copper, zinc, gold, silver and sulphur. Petroleum is also found. Meat packing is the chief industry, with flour milling coming second. Agriculture and animal husbandry form important segments of the economy.

President: Dr. Raul Alfonsin.

Mission in India: Embassy of Argentina, B-8/9, Vasant Vihar, Paschim Marg, New Delhi- 110 057.

AUSTRALIA

Cap: Canberra; **Area:** 7,686,810 sq km; **Pop:** 15519000; **Lang:** English; **Rel:** Christian; **Currency:** Dollar. US\$1=1.42 Dollars.

Australia, variously known as 'The land of the Golden Fleece' and 'The land of the Kangaroo' is the world's largest island and a continent. It is situated to the south-east of Asia, and is surrounded by the Indian Ocean in the north, west and south and by the Pacific Ocean in the east. It has a unique

assortment of flora and fauna, not found elsewhere in the world. The full-blooded aboriginal population is primitive and nomadic. The *boomerang* was invented by these nomads.

Australia is half a world away from Europe, but its people are largely of European descent and they follow a western way of life. One of the most sparsely populated of nations, it is also one of the most highly urbanised with 85% of its people living in cities.

Vast areas of the continent receive only very small amounts of rainfall, limiting development mainly to the coastal fringes.

In 1901, the Australian colonies were federated into the Commonwealth of Australia, by an Act of Parliament. The federating states were six in number—*New South Wales, Victoria, Queensland, South Australia, Western Australia and Tasmania.*

State Capitals: Sydney, Melbourne, Brisbane, Adelaide, Perth, Hobart.

By an agreement reached in 1985 Australia will have no constitutional link with UK hereafter. The Queen's position alone will remain unchanged.

During the 20th century Australia has developed into a modern industrial nation built upon the solid foundation of an efficient and productive agricultural system and large reserves of minerals. Australia is now an important producer and exporter of a wide range of agricultural products especially wool, wheat and meat and its mines provide minerals and metals of many types for use by local and overseas industries, including coal, iron ore, bauxite, gold, silver, lead, zinc, copper, nickel, oil and natural gas.

Head of State: Queen Elizabeth II, **P.M.:** Robert Hawke.

Mission in India: High commission of Australia 1/50-G Shantipath, Chanakyapuri, New Delhi- 110 021.

AUSTRIA

Cap: Vienna; **Area:** 83,853 sq. km. **Pop:** 74,89,000; **Lang:** German; **Rel:** Christian; **Currency:** **Schilling:** \$1 = 23 56 Schilling.

A republic of Central Europe, Austria is bounded by W. Germany, Switzerland and Liechtenstein in the west, Czechoslovakia and W. Germany in the north, Hungary in the east, and Italy and Yugoslavia in the south.

Over 65 per cent of the country is mountainous. Austria, a republic since 1918, regained full sovereignty after World War II in 1955.

Economy depends mainly on mining and manufacturing, trade and services. Austria has iron ore and oil deposits, lignite, magnesite, lead and some copper.

President: Dr. Rudolf Kirchschlager.
Chancellor: Fred Sinowatz.

Mission in India. Embassy of Austria, EP-13, Chandragupta Road, Chanakyapuri, New Delhi-110 021.

THE BAHAMAS

Cap: Nassau; **Area:** 13,939 sq. km.; **Pop:** 2,28,000; **Lang:** English; **Rel:** Christian; **Currency:** Bahamian \$1.05 = £1 Sterling.

The Commonwealth of the Bahamas is an archipelago lying off the south-east coast of Florida. The Bahamas consists of more than 700 islands and 2000 cays and rocks. Only about 30 of the islands are inhabited. The largest island is *Andros* but *New Providence* is the most populous. The capital *Nassau* is situated on this island. Eighty-five per cent of the population is *Negro*, the rest are *Europeans*.

The Bahamas became internally self-governing in 1964 and fully independent in 1973.

Education is free and compulsory between the ages of 5 and 14.

Tourism is the main industry. Fishing constitutes the main occupation. Vegetables and fruits are also grown.

Governor-General: Sir Gerald Cash.
P.M.: Lynden O. Pindling.



BAHRAIN

Cap: Manama; **Area:** 669 sq. km., **Pop:** 384,221; **Lang:** Arabic and English; **Rel:**

Islam; **Currency:** 0.37600 Dinar = US \$ 1.

Bahrain, which became an independent state on Aug. 15, 1971, is an Arab state comprising 33 small islands in the Arabian Gulf. Bahrain is the biggest of the islands and has lent its name to the whole archipelago. It is an independent monarchy.

The traditional occupations of cattle breeding, agriculture and fishing are still practised but many modern industries have also come up. Oil accounts for the lion's share of the state revenues.

The people enjoy a very high standard of life. Education is free upto the secondary level and heavily subsidised with scholarships at higher levels.

Amir: Shaikh Isa bin Sulman Al Khalifa.
P.M.: Shaikh Khalifa bin Sulman Al-Khalifa.

BANGLADESH

Cap: Dhaka; **Area:** 143,998 sq. km.; **Pop:** 98,464,000; **Lang:** Bengali and Bihari; **Rel:** Islam; **Currency:** Taka. \$1 = 26.54 Taka.

Bangladesh is bounded on three sides by India. Burma lies to the south-east and constitutes the only non-Indian boundary of Bangladesh. Bangladesh became an independent state in 1971.

The economy is primarily agricultural. Rice is the most important food crop. Bangladesh is the biggest producer of jute in the world, commanding 80 per cent of the world's total production. Industrially, Bangladesh is backward. Textiles, sugar factories, hosieries, aluminium works and jute mills comprise the bulk of industrial production in the state.

President and Chief Martial Law Administrator: Lieut. Gen. Hossani Mohammad Ershad.

Mission in India: High Commission of Bangladesh, 56-Ring Road, Lajpat Nagar-III, New Delhi-110 024.

BARBADOS

Cap: Bridgetown; **Area:** 430 sq. km.; **Pop:** 262,000; **Lang:** English; **Rel:** Christian; **Currency:** Barbados dollar (BD). US \$1 = BD \$2.01

The island of Barbados is the most easterly of the Caribbean islands, lying about 250 miles north east of the mainland of South

America. It is included in the Windward Isles. Barbados became fully self-governing within the Commonwealth on Nov 30, 1966.

Agriculture and tourism dominate the economy of Barbados. Sugar, molasses and rum account for 90 per cent of exports.

Head of State: Queen Elizabeth II. **Governor-General:** Sir Hugh Springer.

BELGIUM

Cap: Brussels; **Area:** 30,521 sq. km.; **Pop:** 9,877,000; **Lang:** Dutch and French; **Rel:** Christian; **Currency:** Franc. \$1 = 68.64 Francs.

Belgium, named after the Belgae, people of ancient Gaul who crossed the Rhine about the 6th century B.C., has had a turbulent history. It became an independent monarchy in 1830. During both the world wars it was occupied by Germany but freed itself by the end of those wars.

Belgium is located in the very heart of Europe, bordered by the Netherlands in the north, W. Germany and Luxembourg in the east, and France in the south.

Belgium is the most densely populated country in Europe. Although Belgium is essentially a manufacturing country, agriculture and forestry are also very important. The main crops are oats, rye, wheat, potatoes, barley and sugar beets. Coal is the country's only important mineral. Principal industries are steel and metal products, textiles, glass, fertilizer, sugar, heavy chemicals etc. Antwerp is the world's 4th largest port and also the world's biggest diamond-trading centre.

Head of State: King of Baudouin. **P.M.:** Dr Wilfried Martens.

Mission in India: Embassy of Belgium, 50, Chanakyapuri, New Delhi-110 021

BELIZE

Cap: Belmopan. **Area:** 22,965 sq. km. **Pop:** 157,700. **Lang:** English. **Rel:** Christian. **Currency:** Dollar. US \$ 1 = B\$2.

Belize, formerly known as British Honduras, is a Central American republic with the Caribbean to the east, Mexico to the north-west and Guatemala to the south-west. Originally a British colony, it was granted autonomy in 1964 and became completely independent in 1981. The name Belize was

adopted in 1973. Guatemala claims Belize as one of its territories but the claim has not been conceded by Britain. The original capital Belize City was laid waste by a hurricane in 1961. The capital was shifted to Belmopan, an inland town, in 1970.

More than half the population is made up of the so-called Creoles or English-speaking Negroes, found mostly in the coastal regions. The indigenous (Red) Indian population consists of Mayans and Kekchis who live mostly in the reservations.

Forest products especially timber form a major export item. Sugar and citrus fruits form the major products. Wild life includes the curious creature mantee—an amphibian mammal—and several varieties of reptiles.

Gov. Gen.: Dame Elmira Minita Gordon.
P.M.: Manuel Amadeo Esquivel.

BENIN

Cap: Porto Novo; **Area:** 112,622 sq. km.; **Pop:** 3,890,000; **Lang:** French and Tribal dialects; **Rel:** Tribal and Islam; **Currency:** Franc CFA. 1 French Franc = 50 Franc CFA.

The People's Republic of Benin (formerly Dahomey) is located north of the Gulf of Guinea in West Africa. It is bounded by Togo, Upper Volta, Niger and Nigeria.

Formerly, one of the provinces of French West Africa, Benin became an independent state on Aug. 1, 1960. The country had been plagued by coups and counter-coups.

Benin's principal products are palm oil, kernels, peanuts, cotton, coffee and tobacco.

President: Brig-Gen. Ahmed Kerekou.
Pres. of National Exe. Council: Brig-Gen. Ahmed Mathieu Kerekou.

BERMUDA

Cap: Hamilton; **Area:** 53.3 sq. km.; **Pop:** 54,893; **Lang:** English; **Rel:** Christian; **Currency:** Bermuda dollar. US \$ 1 = 1 B\$

Bermuda is a group of some 300 coral islands in the Western North Atlantic. They are said to have been discovered by a Spaniard Juan de Bermudez in 1650. In 1968 it was given the status of a British Associate state with full internal autonomy.

Negroes make up two-thirds of the population. Persons of British or Portuguese stock form the rest.

The chief crops are vegetables, flowers (Easter lilies specially), bananas and citrus fruits. Tourism is the main source of revenue.

Gov. Viscount Dunrossil. **Premier:** John W. D. Swan.

BHUTAN

Cap: Thimphu; **Area:** 47,000 sq. km.; **Pop:** 1,388,000; **Lang:** Dzongkha and Nepali; **Rel:** Buddhist and Hindu; **Currency:** Ngultrum. Indian Rupee also legal tender.

Bhutan is a mountain state in the Himalayas, with China on the north and India on the south. It is an absolute monarchy.

Agriculture is the chief occupation. The principal products are rice, corn, and millet and forest produce like wax, lac, musk, etc. Timber and fruits are exported.

King: Jigme Singye Wangchuck.

Mission in India: Royal Bhutanese Embassy, Chandragupta Marg, Chanakyapuri, New Delhi-110 021.

BOLIVIA

Cap: La Paz; **Area:** 1,098,581 sq. km.; **Pop:** 6,200,000; **Lang:** Spanish; **Rel:** Christian; **Currency:** Peso boliviano. (\$b). US \$1 = \$b 45,000.

Bolivia, a South American state, lies astride the Andes. It is bounded by Brazil in the north and north east, Paraguay in the east, Argentina in the south and Chile and Peru in the west. Lake Titicaca on the Peru-Bolivian border is the highest lake in the world (12,506 ft.).

Originally part of the ancient Inca Empire, Bolivia became independent in 1825. Bolivia has been named after Simon Bolivar, the famous South American fighter for freedom. Bolivia, like most Latin American states, has



had a number of coups and countercoups.

Agriculture, the mainstay of the country, engages 70 per cent of the people. Tin mining is the most important industry. Bolivia produces about 30,000 tons of tin, nearly 15 per cent of the world's total output. Antimony and tungsten are the next most important minerals.

President: Victor Paz Estenssoro.

BOTSWANA

Cap: Gaborone; **Area:** 600,327 sq. km.; **Pop:** 1,042,000; **Lang:** English and Tswana; **Rel:** Tribal and Christian; **Currency:** Pula. US \$1 = P 1.867.

The Republic of Botswana (formerly known as Bechuanaland) is located in Southern Africa, and is bounded by South Africa in the south and east, Namibia in the west and Zimbabwe in the north east. Botswana became independent in Sept. 1966 and assumed its present name.

Cattle industry is the most important economic activity. Beef is the main export. Diamonds, manganese, asbestos, coal, copper and nickel are leading mineral resources.

President: Dr. Quett Ketumile Jon's Masire.

BRAZIL

Cap: Brasilia; **Area:** 8,511,965 sq. km.; **Pop:** 132,648,000; **Lang:** Portuguese; **Rel:** Christian; **Currency:** Cruzeiro = US \$ 1.

Brazil, the largest South American state both in area and population, lies more or less in the centre of South America. It shares its frontiers with ten other countries—Argentina, Bolivia, Paraguay, Uruguay, Peru, Colombia, Venezuela, Guyana, Suriname and French Guiana. Its coastline is confined to the Atlantic sea-board. The bulk of Brazil lies in the tropics. It is a land of dense forests and mighty rivers. The Amazon and the Sao Francisco cover the centre of the country.

More than half of Brazil's population now live in the cities, which are responsible for generating about 35 per cent of the GNP. Among the most important cities are: *Sao Paulo, Rio de Janeiro, Belo Horizonte, Recife, Salvador and Brasilia*. Brasilia, a showpiece of modern architecture and town

24,400 p.c. inflation!

Bolivian inflation, the world's highest, soared to an annual rate of 24,400 per cent in September, 1985 despite Government austerity measures, and shows no sign of falling off, the National Statistics Institute said.

The institute said prices rose 35 per cent in September, an improvement on the 68.5 per cent recorded in August, but the rate for the year to September rose to 24,400 per cent from 20,561 per cent in the 2 months to August. The institute estimated that inflation this month would be over 50 per cent.

President Victor Paz Estenssoro, who took office at the beginning of August, has lifted price controls, frozen public wages and set the peso at a market-related rate in a bid to bring down inflation.

(Reuter: Oct. 29, 1985)

planning, was declared the capital on April 21, 1960.

Brazil's main industries are concentrated at Sao Paulo—shipbuilding, motor cars, textiles, foodstuffs, metals and chemicals. Brazil is the world's largest producer of coffee, bananas, manioc and sugar cane and the second biggest producer of oranges, maize and cocoa.

The major exports of Brazil are soya beans, sugar, coffee, iron ore, cocoa beans, maize and sisal and tobacco.

Brazil possesses vast deposits of mineral wealth—iron, phosphates, uranium, manganese, copper, coal, platinum and gold. Oil is a state monopoly. The wax which is used for phonograph records and insulation is a monopoly product of the state.

President: Jose Sarney.

Mission in India: Embassy of Brazil, 8, Aurangzeb Road, New Delhi.

BRUNEI

Cap: Bander Seri Begawan; **Area:** 5765 sq. km.; **Pop:** 214,440; **Lang:** Malay, Chinese; **Rel:** Islam, **Currency:** Brunei Dollar with the par value of 0.290299 gramme of gold.

The Sultanate of Brunei on the northern side of the island of Borneo lies between two Malaysian territories, Sabah and Sarawak. Brunei Malays, mostly Muslim, form more than half of the population. The Sultanate, once a powerful and independent kingdom, was annexed by Britain who in 1971 granted Brunei full internal autonomy.

Oil and natural gas are Brunei's most valuable resources. Much of Brunei's oil now comes from the offshore Ampa field. Rice is the chief food crop. Other crops are coconuts, sago and rubber. Rubber is an export item.

Sultan: Sir Muda Omar Ali Saifuddin Sa'elul Khair Waddin. **General Adviser to Sultan:** Laila Utama Haji Ibrahim.

BULGARIA

Cap: Sofia; **Area:** 110,912 sq. km.; **Pop:** 9,182,000; **Lang:** Bulgarian, Turkish; **Rel:** Christian; **Currency:** Lev. US \$ 1 = 0.999 leva.

Bulgaria in south-east Europe is bounded by the Black Sea on the east, Turkey and Greece on the south, Yugoslavia on the west and Romania on the north.

Bulgaria, an independent monarchy, became a republic after the Second World War.

The principal crops are wheat, rye, barley, maize, sugarbeet, oats, corn, potatoes and tobacco. Coal, iron ore, copper, lead and zinc are the main mineral resources.

Chairman of the Council of State and Secretary-General of the Communist Party Toder Zhivkov. Chairman, Council of Ministers: Grisha Filipov.

Mission in India: Embassy of Bulgaria, 16/17 Chanakyapuri, New Delhi-110 021.

BURMA

Cap: Rangoon; **Area:** 676,552 sq. km.; **Pop:** 38,513,000; **Lang:** Burmese and Tribal; **Rel:** Buddhism; **Currency:** Kyat. US \$ 1 = K. 8.89.

A republic of south-east Asia, Burma is bordered by Bangladesh, India, China, Laos and Thailand. The country is watered by the *Irrawady* which forms one of the most fertile basins in all Asia.

Originally a part of British India, Burma became a separate unit of the British Commonwealth in April 1937. It became an independent country on January 4, 1948.

Burma is known as the "rice bowl of the Far East". The chief minerals are petroleum, lead, tin, zinc, tungsten, copper, antimony, silver and gems. The rubies, sapphires and jade found in Burma are especially famous. Teakwood is exported on a large scale.

Head of State: U San Yu. **P.M.:** U Maung Maung Kha.

Mission in India: Embassy of Burma, Plot No. 3, Block No. 50/F, Nyaya Marg, Chanakyapuri, New Delhi-110 021.

BURKINA FASO

Cap: Ouagadougou; **Area:** 274,200 sq. km.; **Pop:** 6,768,000; **Lang:** French and native languages; **Rel:** Tribal and Muslim; **Currency:** Franc CFA. US \$ 1 = 512 francs.

The Republic of Burkina Faso is a landlocked state in West Africa surrounded by Mali, Niger, Benin, Togo, Ghana and Ivory Coast.

Formerly a province of French West Africa called *Upper Volta* the country gained full independence in 1960. Name changed to Burkina Faso in 1984.

It is almost exclusively an agricultural country with 80 per cent of the population dependent on agriculture. Livestock raising is highly developed. Principal crops are sorghum, millet, yams, cotton, rice, peanuts and karite. Industry is limited to local handicrafts.

Head of State and Govt: Capt. Thomas Sankara.

BURUNDI

Cap: Bujumbura; **Area:** 27,834 sq. km.; **Pop:** 4,503,000; **Lang:** French and Kirundi; **Rel:** Tribal and Christian; **Currency:** Burundi Franc. US \$ 1 = 128.3.



The Republic of Burundi is a small state in Eastern Africa, bordered by Zaire in the west, Rwanda in the north and Tanzania in the east and south.

Burundi attained independence on July 1, 1962. Prior to independence, it formed part of the Belgian-administered UN Trust Territory of Rwanda-Urundi.

The population consists of *Hutu* or *Bahutu* tribesmen, *Tutsi* or *Watutsi* people and *Twa* or *Batwa* pygmies. The economy is entirely agricultural, manioc and sweet potato, being the important food crops and coffee the major cash crop.

President and Party Chairman: Col. Jean-Baptiste Bagaza.

CAMEROON

Cap: Yaounde; **Area:** 475,442 sq. km. **Pop:** 9,467,000; **Lang:** French and English; **Rel:** Tribal and Christian; **Currency:** Franc CFA. French franc 1 = 50 franc CFA.

Located in West Africa, Cameroon is bounded by the Gulf of Guinea, Nigeria, Chad, the Central African Republic, Gabon, the Congo Republic and Equatorial Guinea.

Cameroon, originally part of the German colony in W. Africa, became a republic in 1960. In 1961, British Cameroon was federated with Cameroon, forming the Federal Republic of Cameroon.

Cameroon has a central Government and two provincial governments—East Cameroon and West Cameroon.

Cameroon is mainly an agricultural country raising cocoa, palm oil, coffee, rubber, groundnuts, bananas, and cotton. East Cameroon is industrially developed, aluminium and chemicals being the main industries.

President: Paul Biya. **P.M.:** Bello Bonda Maigari.

CANADA

Cap: Ottawa; **Area:** 9,976,139 sq. km.; **Pop:** 25,302,000; **Lang:** English & French; **Rel:** Christian; **Currency:** Dollar. US \$ 1 = Canadian \$ 1.39.

Canada is the second largest country in the world. It occupies all of the northern-most part of N. America except Alaska in the west and the small French islands of St. Pierre & Miquelon. It is bounded in the north by the

Provinces	Capital	Area (sq. km.)
Alberta	Edmonton	644,390
British Columbia	Victoria	929,730
Manitoba	Winnipeg	548,360
New Brunswick	Fredericton	72,090
Newfoundland	St John's	371,690
Nova Scotia	Halifax	52,840
Ontario	Toronto	891,190
Prince Edward Island	Charlottetown	5,600
Quebec	Quebec	1,356,790
Saskatchewan	Regina	570,700
Territories		
Yukon Territory	Whitehouse	478,970
Northwest Territories	Yellowknife	3,293,020

Arctic Ocean, Baffin Bay and the Davis Strait, in the north east and in the east by the Atlantic Ocean, in the south by the USA, in the west by the Pacific Ocean and in the north-west by the US state of Alaska. Twenty-seven per cent of the population speak French and the rest English.

Canada is a federation comprising 10 Provinces and 2 Territories. The federal capital is at Ottawa. It is a member of the Commonwealth. By the historic 'Canada Act of 1982' Britain transferred constitutional powers to Canada.

The provinces with more than a million population are Ontario (8), Quebec (6), British Columbia (2), Alberta and Manitoba (1 million each).

From a primarily agricultural country famous for logging, fishing and fur, Canada has transformed itself into one of the leading industrial countries of the world. Automobile parts head the export list, followed by wood pulp and timber. Wheat is still a major item of export. Canada's industrial structure has been built up mainly by foreign investments especially USA.

Canada is today the world's largest producer of asbestos, silver, nickel, and zinc. It is rich in many other minerals, iron, copper, uranium, cobalt, sulphur, lead and gold. It has vast reserves of oil and natural gas. Though Canada is ninth in the world in crude oil production it is Canada's biggest dollar earning mineral.

Head of State: Queen Elizabeth II. **Gov. Gen.** Jeanne Sauve. **P.M.:** Brian Mulroney.

Mission in India: High Commission of Canada, 7/8 Shantipath, Chanakyapuri, New Delhi-110 021.

CAPE VERDE

Cap: Praia; **Area:** 4033 sq. km.; **Pop:** 296,093; **Lang:** Portuguese; **Rel:** Christian; **Currency:** Escudo Caboverdianos. US \$ 1 = 89.27.

Cape Verde, formerly a Portuguese colony, lies in the Atlantic Ocean, off west Africa. It consists of 10 islands and 5 islets divided into two groups, Windward and Leeward. The soil is poor and cultivation very little. Food is a major item of import. Salt, fish, coffee and groundnuts are exported. Cape Verde became independent on July 5, 1975.

When the Portuguese discovered the island, it was uninhabited. Portuguese settlers and the Negroes they brought in to work their plantations, form the basic stock of the present population.

President: Aristides Maria Pereira. **P.M:** Maj. Pedro Verona Rodrigues Pres.

CEN. AFRICAN REPUBLIC

Cap: Bangui; **Area:** 622,984 sq. km.; **Pop:** 2,508,000; **Lang:** French and Sangho; **Rel:** Christian and Tribal; **Currency:** Franc CFA. French franc 1 = 50 franc CFA.

The Central African Republic lies in the heart of equatorial Africa. It is bounded by Chad to the north, Sudan to the east, People's Republic of the Congo and Zaïre to the south and Cameroon to the west.

The Central African Republic became self-governing in 1958, and fully independent in 1960, as a member state of the French Community. In 1966 Col. Jean Bedel Bokasa, Chief of Staff of the Army, ousted President David Dacko and seized control of the government.

Bokasa was made President for life in 1972. In 1976, he set himself up an emperor, after the Napoleonic pattern. In 1979 a popular uprising drove out this two-bit Napoleon. Interestingly enough, it was Bokasa's own predecessor in office, viz. David Dacko, who overthrew the self-styled Emperor in a bloodless coup on Sept. 20, 1979.

Principal agricultural products are cotton

and coffee. Cotton leads in exports. Diamonds account for half the country's export earnings. Uranium mining is becoming increasingly important.

Head of State and Govt. Gen. Andre Kollingba.

CHAD

Cap: Fort-Lamy; **Area:** 1,284,000 sq. km.; **Pop:** 4,901,000; **Lang:** French and Arabic; **Rel:** Muslim and Tribal; **Currency:** Franc CFA. French f 1 = 50 CFA.

The Republic of Chad is bounded by Libya on the north, Sudan on the east, the Central African Republic on the south and Cameroon and Niger on the west.

Formerly a province of French Equatorial Africa, Chad became independent on August 11, 1960.

The country's economy is entirely rural and based on agriculture and animal husbandry. Cotton and meat are the main exports. Cattle, sheep & camels are raised.

Hissene Habre was sworn in as President on 21 Oct. 1982. But in June 1983 the Libyan-backed forces of former Pres. *Goukouni Oueddei* reoccupied part of the country, and in early 1985 the country remained partitioned between the two sides.

CHILE

Cap: Santiago; **Area:** 756,626 sq. km.; **Pop:** 11,878,000; **Lang:** Spanish; **Rel:** Christian; **Currency:** Peso. US \$ 1 = 143 Pesos.

The Republic of Chile lies on the Western seaboard of South America, occupying the strip of land between Peru and Bolivia in the north to Cape Horn in the south.

Originally a Spanish colony, Chile became independent on September 18, 1810.



Though wheat and other cereals are cultivated. Chile has to import about one-third of its food. It is the world's fourth largest producer and the second largest exporter of copper. There are important deposits of nitrate, gold, silver and iron ore. Oil production provides about half the oil required by the country.

President: Augusto Pinochet Ugarte.

Mission in India: Embassy of Chile, 1/13 Shantiniketan, New Delhi-110 021.

CHINA

Cap: Beijing (Peking); **Area:** 9,561,000 sq. km.; **Pop:** 1,051,551,000; **Lang:** Chinese (Mandarin) and Mongol; **Rel:** Confucian and Taoist; **Currency:** Yuan. US \$ 1 = 2.53 Yuan.

The most populous country in the world and the third largest in area, China is bounded by the USSR, Mongolia, N. Korea, Vietnam, Burma, India, Bhutan, Nepal, Pakistan and Afghanistan. China is made up of 21 provinces, 5 autonomous regions and three municipalities—Peking, Shanghai and Tientsin.

One of the oldest countries in the world, China became a republic in 1912. The People's Republic of China was proclaimed in Peking on September 21, 1949.

On Oct. 26, 1971 China was admitted as a member of the UN displacing Nationalist China (Taiwan).

China is essentially an agricultural country. The main crops are rice, other grains, tea, tobacco, sugarcane, jute, soya, groundnut and hemp. The main forest products are teak and tung oil. Among principal industries are cotton and woollen mills, iron, leather and electrical equipments. The chief minerals are coal, manganese, iron ore, gold, copper, lead, zinc, silver, tungsten, mercury, antimony and tin. Petroleum industry is steadily growing.

China is a nuclear power well advanced in space technology. It launched its first earth satellite in April, 1970.

State President: Li Xiannian. **Premier:** Zhao Ziyang.

Mission in India: Embassy of China, 50-D Shantipath, Chanakyapuri, New Delhi-110 021.

COLOMBIA

Cap: Bogota; **Area:** 1,138,400 sq. km.; **Pop:** 28,110,000; **Lang:** Spanish; **Rel:** Christian; **Currency:** Pesos. US \$ 1 = 118.34 Pesos.

The Republic of Colombia, situated in the north west of South America, extends up to the Isthmus of Panama, with the Caribbean Sea on the north and the Pacific Ocean on the west. It is bounded on the north east by Venezuela, on the east by Brazil and on the south by Peru and Ecuador. *Bogota*, the capital founded in 1538, is situated in the Andes, 8600 ft. above sea level.

Colombia was once a part of the South American Spanish Empire. In 1819, Simon Bolivar defeated decisively the Spanish forces breaking the hold of Spain. Bolivar's plan to unite New Granada with Venezuela and Ecuador in the Greater Colombia Confederation was fulfilled by the Congress of Angostura (1819), lasting until 1830.

Colombia's main produce is coffee, which accounts for 61.2 per cent of the country's exports. Other products are bananas, fresh flowers, cotton fibre, sugar, rice, tobacco, maize and wheat. The country is the world's leading producer of emeralds and is a substantial producer of platinum and gold. It holds the largest coal reserves in Latin America, rich nickel deposits and natural gas fields.

Industries include textiles, beverages, food products, chemicals and non-metallic minerals.

President: Dr. Belisario Betancur.

Mission in India: Embassy of Colombia, 82-D, Gr. Fl., Malcha Marg, Chanakyapuri, New Delhi-110 021.

THE COMOROS

Cap: Moroni; **Area:** 2274 sq. km.; **Pop:** 443,000; **Lang:** Arabic and Comoran; **Rel:** Muslim and Christian; **Currency:** Franc CFA. French Fl = 50 F CFA.

The Comoro Islands, formerly a French Overseas Territory, lie at the northern end of the Mozambique Channel, between Africa and Madagascar. The archipelago consists of 4 islands—*Grande-Comoroe*, *Anjouan*, *Mayotte* and *Moheli*—and a number of islets and coral reefs. The main islands are volcanic and Grande-Comoroe, the largest island,

is dominated by Mount Karthala (2361 m), an active volcano. The islands are densely forested.

The population is a mixture of various strains—Arabs, Africans, Malagasys, Persians, Indians, Indonesians and Europeans. African and Arab influences are strongest. A purely European population of around 1500 completes the scene. Grande-Comoroe is the most populous island and has as capital and principal town, *Moroni*. Agriculture is the mainstay of the economy.

President: Ahmed Abdullah
Abderemane, P.M.: Ali Mroudjæ.

THE CONGO

Cap: Brazzaville; **Area:** 342,000; sq. km.; **Pop:** 1,695,000; **Lang:** French and Lingala; **Rel:** Tribal and Christian; **Currency:** Franc CFA. French F 1 = 50 F CFA.

The People's Rep. of the Congo is bounded on the north by Cameroon and the Central African Republic, on the east and south by Zaire and on the west by the Republic of Gabon and the Atlantic.

Formerly part of the French Equatorial Africa, the Republic of the Congo became autonomous within the French Community in 1958 and fully independent in Aug. 1960. In 1969 a new constitution was promulgated.

Main exports are timber, diamonds, palm oil, crude petroleum, sugar and groundnuts.

President: Denis Sassou Nguesso; **P.M.:** Ange-Edouard Pongou.

COSTA RICA

Cap: San Jose; **Area:** 51,100 sq. km.; **Pop:** 2,534,000; **Lang:** Spanish; **Rel:** Christian; **Currency:** Colone (C) US\$ 1 = C 48.20.

The Republic of Costa Rica is a Central American state. It lies between Nicaragua and Panama. The Caribbean Sea is on the east and the Pacific Ocean on the west.

For nearly three centuries Costa Rica formed part of the Spanish American dominion. In 1821 it became independent.

The country is mainly agricultural. Coffee is the most important product, accounting for about half the exports. Bananas, cocoa, cattle and recently sugar are the other items of export.

President: Luis Alberto Monge Alvarez.

CUBA

Cap: Havana; **Area:** 110,922 sq. km.; **Pop:** 9,966,000; **Lang:** Spanish; **Rel:** Christian; **Currency:** Peso. £ 1 = 0.966 Pesos.

Cuba, the largest island in the Greater Antilles group is known as the Pearl of Antilles. Its neighbours are USA, Mexico, Jamaica and Haiti. The Bahama Islands are to the north.

Columbus discovered Cuba in 1492 and Spain ruled it for four centuries. In 1898 Cuba became an independent republic.

In 1959 Dr. Fidel Castro overthrew General Batista, the dictatorial President and took over power.

Cuba is the largest producer of sugar in the world. Tobacco is the second largest crop. Cattle, poultry and fishing have become important in recent years. Cuba is rich in nickel deposits. Copper, chromite and manganese are also found.

President: Dr. Fidel Castro Ruz. **First Vice President:** Raul Castro Ruz.

Mission in India: Embassy of Cuba, D-5, South Extension, Part II, New Delhi-110 049.

CYPRUS

Cap: Nicosia; **Area:** 9,251 sq. km.; **Pop:** 659,000; **Lang:** Modern Greek and Turkish; **Rel:** Christian and Muslim; **Currency:** Cyprus Pound. US \$ 1 = £C Pound 0.909.

The Republic of Cyprus lies in the Mediterranean Sea, about 70 km south of Turkey, and 104 km west of Syria.

The Greeks demanded union with Greece (*Enosis*). The Turks opposed the movement. In February 1952 the conflict ended on a compromise and Cyprus became independent. Archbishop of Cyprus Makarios III was



elected the first President in December, 1959. But factional fighting broke up the country into two halves.

Although Cyprus has derived its name from copper, for which the island was famous in ancient days, the country is essentially agricultural. Copper and gypsum account for two-thirds of the exports.

Cyprus became a Crown Colony of Britain in 1925. British rule was opposed both by the Greek and Turkish factions.

President: Spiros Kyprianou.

Mission in India: High Commission of Cyprus, 52, Jor Bagh, New Delhi-110003.

Consulate: Bombay—Carmichael House, 2nd Floor, Carmichael Road.

CZECHOSLOVAKIA

Cap: Prague; **Area:** 127,877 sq. km.; **Pop:** 15,588,000; **Lang:** Czech and Slovak; **Rel:** Christian; **Currency:** Koruna (KCs). US \$ 1 = 5.89 Kcs.

A socialist republic landlocked in Central Europe, Czechoslovakia lies between Poland, USSR, Hungary, Austria and Germany (West and East). The State is composed of two main population groups, Czechs and Slovaks.

The Czechoslovak Socialist Republic was established in Jan. 1969 as a federal state of two nations of equal rights—the Czechs and the Slovaks. The Czechs and the Slovaks form two republics within the federation, each with its own government.

Czechoslovakia is a highly industrialized country. Principal exports are machinery and equipment, chemicals and fuels, glass and other manufactured goods. Wheat, barley, potatoes and sugar beet are among the important crops.

President: Gustav Husak. **P.M.:** Lubomir Strougal.

Mission in India: Embassy of Czechoslovakia, 50-M Niti Marg, Chanakyapuri, New Delhi-110021.

Consulate: Bombay—'Marcopia', 5, Deshmukh Marg.

DENMARK

Cap: Copenhagen; **Area:** 43,074 sq. km.; **Pop:** 5,141,000; **Lang:** Danish; **Rel:** Christian; **Currency:** Krone. US \$ 1 = 12.25 kroner

Turkish Cyprus

The Turkish controlled area of northern Cyprus unilaterally declared independence in 1983. It has been named 'Turkish Republic of Northern Cyprus.'

The centre-right and left-of-centre Cypriot coalition Government headed by the Prime Minister-designate Dervis Eroglu, was officially installed in power in July 1985. The coalition became official when its programme was endorsed by the majority of the newly elected Parliament

Eroglu, whose National Unity Party is allied with the Communal Liberation Party, received 32 votes for his programme against 16 by the opposition (pro-Moscow) Republican Turkish Party and the Renaissance Party deputies in the 50-strong Parliament elected last June.

Rauf Denktash is the President of the Republic.

Denmark is situated in northern Europe between the North Sea and the Baltic. It comprises the peninsula of Jutland, the islands of Zealand, Funen and Bornholm and 480 smaller islands. Greenland and the Faroe Islands also form part of the Kingdom of Denmark.

Denmark is a constitutional monarchy, the Queen and the Parliament (Folketing) jointly holding legislative powers.

About 70 per cent of the land is under cultivation. Denmark is one of the largest exporters of dairy products. Fisheries form an important occupation. Denmark is famous for its co-operative institutions. The first co-operative society was established in 1866. Shipbuilding, machinery of different types, textiles, iron and steel-ware account for a major portion of industry.

Head of State: Queen Margarethe II. **P.M.:** Poul Shueter.

Mission in India: Royal Danish Embassy, 2, Golf Links, New Delhi-110 003.

Consulates: Bombay—L&T House, Narotham, Morajee Marg, Ballard Estate.

Madras: 292, Mowbrays Road.

DJIBOUTI

Cap: Djibouti; **Area:** 21,783 sq. km.; **Pop:** 340,000; **Lang:** Somali and French; **Rel:** Islam; **Currency:** Djibouti Franc. US \$ 1 = 198.16 DF

Djibouti, first known as French Somaliland and then as the French Territory of Afars and Issas, became independent on June 26, 1977 under the name of Djibouti.

Lying between Ethiopia and Somalia and looking out on the Red sea and the Gulf of Aden, the state is of extreme strategic importance.

The land is economically poor being mostly volcanic desert. The indigenous population is mostly Muslim. Agriculture is possible only in restricted areas with irrigation facilities. Goats, sheep and camels form the major wealth of the state. Salt is a major product with huge salt deposits in the lakes of Alol and Assal. Trade is almost entirely based on the capital Djibouti.

President: Hassan Gouled Aptidon, **P.M.:** Barkat Gourad Hamadore.

DOMINICA

Cap: Roseau; **Area:** 750 sq. km.; **Pop:** 74,859; **Lang:** English and French Patois; **Rel:** Christian; **Currency:** US \$ 1 = EC\$ 2.70.

Commonwealth of Dominica lies in the Lesser Antilles. Once a British protectorate, it assumed the status of a British Associate State in 1967 and became fully independent in 1978.

The island is volcanic in origin and largely mountainous. The population includes Negroes, Mulattoes, Carib Indians and Europeans.

Exports include bananas, cocoa, copra and fruits.

President: Aurelius Marie; **P.M:** Mary Eugenia Charles.

DOMINICAN REPUBLIC

Cap: Santo Domingo; **Area:** 48,422 sq.km. **Pop:** 6101000 **Lang:** Spanish **Rel:** Christian. **Currency:** Peso Oro. US\$1 = 1 Peso Oro.

The Dominican Republic occupies the eastern two-thirds of Hispaniola, the second largest island of the Greater Antilles. Haiti bounds it on the west, the Atlantic borders it

in the north and the Caribbean in the south. Originally under Spain, the Dominican Republic became independent in 1844.

The state is predominantly agricultural. The most important crops are sugarcane and coffee.

President: Salvador Jorge Blanco.

ECUADOR

Cap: Quito; **Area:** 283,561 Sq.km. **Pop:** 90,90,000; **Lang:** Sapanish and tribal dialects; **Rel:** Christian; **Currency:** Sucre. US\$1 = 95.75 Sucre.

Ecuador lies on the west coast of South America. It is bounded on the north by Colombia, on the east and south by Peru and on the west by the Pacific Ocean. Two ranges of the Andes cross the country from north to south, dividing it into three natural regions, coastal, highlands and the orient. *Guayaquil* is the chief seaport and airport. The *Galapagos Islands* belong to Ecuador. Ecuador, a part of the great Inca Empire, came under Spanish rule in 1533. It became independent in 1830.

Ecuador is the world's largest producer of bananas. Sugar, African palm, and rice are grown. Silver ore is now the chief mineral product. There are large deposits of copper, gold and zinc. The production of petroleum is increasing. The so-called 'Panama' hats made of Toquilla straw are made in Ecuador.

President: Leon Febres Cordero.

EGYPT

Cap: Cairo; **Area:** 997,677 sq.km. **Pop:** 4,56,57,000 **Lang:** Arabic; **Rel:** Muslim and Christian; **Currency:** Pound. US\$1 = 1.83 £E.



Egypt, traditionally known as the Gift of the Nile, occupies north east Africa and is bounded by the Gulf of Aqaba, Israel, Sudan, Libya, the Mediterranean Sea and the Red Sea.

Egypt has one of the oldest civilizations in the world, its recorded history going back to more than 5000 B.C. In 1922 Egypt became an independent monarchy and in 1952 a republic.

The main agricultural area is Lower Egypt which covers the delta of the Nile. The chief crops are cotton, onions, wheat, maize, millet, rice, sugarcane and fruits of various kinds.

Principal exports are cotton, rice, mineral products, textiles, refrigerators, tyres, cement and electrical instruments.

President: Hosni Mubarak **PM:** Ali Lafti. *Mission in India.* Embassy of Egypt, 55-57, Sunder Nagar, New Delhi.

Consulate: Bombay- Maker Tower 'B', Flat No. 41/B.

EL SALVADOR

Cap: San Salvador; **Area:** 21,393 sq. km.; **Pop:** 53,88,000; **Lang:** Spanish; **Rel:** Christian; **Currency:** Colon. US\$1 = C 2.50.

El Salvador is bounded on the north-west by Guatemala, on the north and east by Honduras and on the south by the Pacific Ocean. Became independent in 1821.

The country is predominantly agricultural. The principal crop is coffee which provides half the exports. Other products are cotton, maize and sugar. Fisheries are being developed and figure prominently in the export list. Industry is growing.

President: Jose Napoleon Duarte.

EQUATORIAL GUINEA

Cap. Malabo (formerly Santa Isabel); **Area:** 28,051 sq.km; **Pop:** 3,83,000; **Lang:** Spanish and Fang; **Rel:** Christian; **Currency:** Ekuele (plural Bikuele). In 1984 the currency joined the franc zone.

Equatorial Guinea, formerly Spanish Guinea, comprises the islands of *Fernando Poo*, *Corisco*, *Great Elobey*, *Small Elobey* and *Annobon* and the mainland territory of *Rio Muni* on the west coast of Africa. In 1975, almost all place names were changed by

President Macias Nguem. The capital Santa Isabel thus became Malabo.

Francisco Macias Nguema was ousted by his nephew, Mbasogo on Sept. 29, 1979.

The island of Fernando Poo is mostly mountainous. Coffee is cultivated upto 3000 ft and cocoa upto 2000 ft. There are also forests of ebony, mahogany and oak. Other products are cocoa, coffee, timber, palm oil and bananas.

President: Lt. Col Teodoro Obiang Nguema Mbasogo.

ETHIOPIA

Cap: Addis Ababa; **Area:** 12,21,900 sq.km. including Eritrea; **Pop:** 3,54,20,000 **Lang:** Amharic (official language), English; **Rel:** Christian and Islam; **Currency:** Birr US\$1 = 2.02 Birr.

Ethiopia is a mountainous country in North East Africa, having access to the Red Sea, through the province of Eritrea, which was federated with Ethiopia in 1952.

Ethiopia is one of the most ancient countries of the world, with a colourful history. The Ethiopian emperors claimed descent from Solomon and the famous Queen of Sheba. The last Emperor of Ethiopia Haile Sellasie I was deposed by the armed forces which took over the govt. in 1974.

The economy is mainly agricultural and pastoral. Coffee export earned 70% of all revenue in 1977. Hides and skins, pulses and oil seeds are also exported. Industry is confined to food processing, manufacture of textiles and goods for local consumption.

Chairman of the Council of Ministers: Lt. Col. Mengistu Haile Mariam.

Mission in India: Embassy of Ethiopia, 7/50-G Satya Marg, Chanakyapuri, New Delhi-110 021.

FIJI

Cap: Suva; **Area:** 18,376 Sq.km. **Pop:** 6,74,000. **Lang:** English and Figian. **Rel:** Christian and Hindu. **Currency:** Dollar. US\$1 = \$F1.20.

Fiji consists of about 800 islands, lying 1100 miles north of New Zealand. The largest of the islands *Viti Levu* constituting more than half of the total land area of Fiji islands is the seat of the capital, *Suva*. Fiji lies on the main

route between Australia, New Zealand and North America and is the centre of communications in the South West Pacific.

These islands came under British rule in 1874. From 1879, indentured Indian labour was imported into the islands to work on European sugar plantations. Practically all the Indian workers settled permanently in the islands. Their descendants now form 50 per cent of the population. Melanesians, the original inhabitants, make up 43 per cent, the rest being made up of Europeans, Chinese and others. On Oct. 10, 1970 Britain granted independence to Fiji.

Fiji is a famous tourist centre. Its major products are agricultural. Sugar and coconuts form 90 per cent of the total exports. Mining is limited and industries are few.

Head of State: Queen Elizabeth II represented by **Gov. Gen.** Ratu Sir Penaia Gani-fau. **P.M.** Ratu Sir Kamisese K.T. Mara.

FINLAND

Cap: Helsinki. **Area:** 337,032 sq.km. **Pop:** 48,59,000. **Lang:** Finnish and Swedish; **Rel:** Christian. **Currency:** Mark. US\$1 = 7.10 Marks.

The Republic of Finland is bordered on the north by Norway, on the west by Sweden and the Gulf of Bothnia, on the south by the Gulf of Finland and on the east by the USSR.

Finland is a Baltic State, which once formed part of the Russian Empire. It became an independent republic in 1917.

Finland's economy is based on conifer forests which cover 65 per cent of the land. Paper and pulp industry is highly developed. Other industries are shipbuilding, metals, textiles, leather and chemicals. Finland has a fairly big fleet of merchant marine with a gross tonnage of 2,274,605 (1977).

President: Mauno Koivisto, **P.M.** Kalevi Sorsa.

Mission in India: Embassy of Finland, 25, Golf Links, New Delhi-110 003.

Consulates: Bombay- Bennet, Coleman & Co., Dr. D.N. Road.

Calcutta: C/o Tata Finlay Ltd., 1, Bishop Lefroy Road, P.O. Box 209.

Madras: C/o Travancore Rayon Ltd., 762 Mount Road, P.O. Box 2730, Madras-600 002.

FRANCE

Cap: Paris; **Area:** 551,695 sq.km. **Pop:** 5,44,49,000. **Lang:** French; **Rel:** Christian. **Currency:** Franc. US\$1 = 10.48 Francs.

France, the largest country in western Europe, lies between three big countries—Spain, Germany and Italy and the lesser states of Switzerland, Belgium and Luxembourg. The North Atlantic Ocean (Bay of Biscay) lies to the west and the English Channel to the north, while the Mediterranean Sea bounds the south. The island of Corsica—the birthplace of Napoleon—forms an integral part of France.

Once a grand monarchy, the French Revolution (1789-1793) made France a republic. Since then republican and imperial forms of government followed one after another until the Fifth Republic and the French Community came into being in 1958 under President Charles de Gaulle.

The country is self-sufficient in agricultural production and exports large quantities of agricultural products to other countries. Among manufactured products, the most important are chemicals, silk, cotton textiles, automobiles, aircrafts, ships, precision instruments, electronic equipments, perfumes and wines. Over the last 20 years urban development and technological progress have profoundly changed French people's everyday life.

President: Francois Mitterrand. **P.M.** Laurent Fabius.

Mission in India: Embassy of France, 2, Aurazzeb Road, New Delhi-110 001.

Consulates: Bombay- Mercantile Bank Building, 52/60, M.G. Road.

Calcutta: 23, Park Mansions.

Madras: Kothari Buildings, Nungambakam, High Road.



GABON

Cap: Libreville; **Area:** 267,000 Sq.km. **Pop:** 11,46,000. **Lang:** French and Bantu dialects; **Rel:** Christian and Tribal; **Currency:** Franc FA. French F1 = 50 FCFA)

The Gabon Republic, situated on the western coast of Africa, is bounded by Equatorial Guinea, Cameroon, the Congo Republic and the Atlantic Ocean. Formerly a province of French Equatorial Africa, Gabon attained independence on Aug. 17, 1960.

The economy, hitherto largely dependent on forestry, is now dominated by mining. The manganese deposit at Moanda in the south is one of the world's richest deposits. Crude oil production is already the fifth highest in Africa. Uranium, gold and iron ore are also mined.

President: Albert-Bernard (Omar) Bongo, **P.M.** Leone Mebiame.

THE GAMBIA

Cap: Bathurst; **Area:** 11,295 sq.km.; **Pop:** 6,30,000; **Lang:** English and Mandinka; **Rel:** Muslim and Christian. **Currency:** Dalasi-US\$1 = 4.74 Dalasi.

The Gambia is a narrow strip of land in West Africa, extending inland from the Atlantic Ocean for about 30 miles on either side of the Gambia River and surrounded on three sides by Senegal. Nearly half the inhabitants belong to the Mandingo tribe.

Formerly a British colony and protectorate, Gambia became an independent state within the Commonwealth on Feb. 18, 1965 and a Republic in April 1970.

Peanuts are the main crop, along with rice and palm kernels. Textiles, food and manufactured goods are significant items of import.

President: Sir Dawda Kairaba Jawara.

GERMANY (East)

Cap: Berlin; **Area:** 108,179 sq.km. **Pop:** 1,66,58,000 **Lang:** German; **Religion:** Christian; **Currency:** Mark US\$1 = 3.43 M.

The German Democratic Republic (East Germany) is bounded on the north by the Baltic Sea, west, south-west and south by West Germany, south east by Czechoslovakia and east by Poland along the line of the

rivers Oder and Neisse.

When Germany surrendered to the Allies in 1945 the country was divided into four zones of Allied occupation. The northern section of East Prussia with about 14 per cent of the population and 24 per cent of the area of the former Reich came under Russian occupation. The area under Russian occupation was constituted into the independent socialist state of the German Democratic Republic on October 7, 1949.

Important crops of East Germany are wheat, rye barley, oats and potatoes. Farming is organised on state-sponsored co-operative basis. The only natural power source is lignite (brown coal) which supplies 90 per cent of the basic energy. Industries are highly developed-machines, chemicals, heavy engineering and shipbuilding. Special stress is laid on quality products like optics, electronics and precision tools. The Leipzig trade fairs are well known throughout the world.

Chairman of the Council of State: Erich Honecker.

Mission in India: Embassy of Germany, Nyaya Marg, Chanakyapuri, New Delhi 110 021.

GERMANY (West)

Cap: Bonn; **Area:** 248,625 sq.km. **Pop:** 6,12,14,000 **Lang:** German. **Rel:** Christian. **Currency:** Deutsche Mark US\$1 = 3.43 DM

The Federal Republic of Germany lies in the heart of Europe. Its neighbours to the west are the Netherlands, Belgium, Luxembourg, and France, to the south Switzerland and Austria, to the east Czechoslovakia and East Germany and to the north Denmark.

It was Bismarck, Chancellor of Prussia who laid the foundation of the German Empire in 1867. After the defeat of Germany in the Second World War the erstwhile German territory was divided into two occupation areas, Russia occupying East Germany and USA, Britain and France occupying West Germany. The city of Berlin was also divided into West Berlin (USA, Britain and France) and Berlin (Russia). West Germany came into being on May 23, 1949. The German Federal Republic consists of 10 states (Lander). West Berlin is also a state of the Federal Republic.

Greek Tragedy

Recession in the shipping industry has hit Greece the hardest. Experts say the scenario there has all the makings and inexorability of a Greek Tragedy.

During the boom period of the 1970s, many international banks financed Greek shipowners and builders. They now complain of outstanding loans totalling a staggering \$ 70 billion.

To cut losses, they have resorted to foreclosures and seizures of ships and some have deserted the "sinking industry". Between January 1982 and January 1985, the industry lost 1,000 ships (grossing nine million tonnes) to scrapyards and flags of convenience.

Time was when Greece had the world's most glamorous fleet with shipping magnates like Aristotle Onassis directing their empire from privately-owned islands in the Aegean. The formerly bustling Piraeus port is now in the doldrums and old hands say it is the worst crisis since the 1929 crash.

Though a maverick member of the EEC, Greece still claims 38 per cent of EEC cargo freight while 70 per cent of the entire EEC fleet is Grec-owned. This has meant that a sick Greek fleet has adversely hit commerce of the EEC.

(November 28, 1985)

West Germany showed phenomenal economic growth during post-war years in industrial production, notably in iron and steel, vehicles, engineering, ship-building, electrical goods and chemicals. Since the currency reform in 1948 the economy of W. Germany has grown prodigiously.

Federal President: Richard Von Weizsaecker. **Federal Chancellor:** Helmut Kohl.

Mission in India: Embassy of Federal Republic of Germany, 6 Shantipatha, Chanakyapuri, New Delhi-110 021.

Consulates: Bombay- Hoechst House, 10th Floor, Nariman Point;

Calcutta: Hastinjs Park Road, Alipore;

Madras: 14, Bishop's Garden, Greenways road, Adayar.

GHANA

Cap: Accra; **Area:** 2,39,460 sq.km.; **Pop:** 1,30,44,000; **Lang:** English (official language) and eight major national languages; **Rel:** Christian and Muslim; **Currency:** Cedi. US \$1=C50.

Ghana, named after an earlier state along the river Niger (AD 800-1070), is composed of the former British Gold Coast colony and the British-ruled Togoland in Western Africa.

Ghana became an independent republic within the Commonwealth on July 1, 1960.

Ghana is primarily an agricultural country. It is the world's largest producer of cocoa which constitutes its biggest export item. Other cash crops include kolanuts, palm products, bananas, coffee, shea-nuts and rubber. It also exports timber, gold, diamonds, manganese and bauxite.

Provisional National Defence Council Chairman: Flt. Lt. Jerry Rawlings. **PM.:** P.V. Obeng.

Mission in India: High Commission of Ghana, A-42, Vasant Marg, Vasant Vihar, New Delhi-110 057.

GREECE

Cap: Athens; **Area:** 131,990 sq. km.; **Pop:** 9884000; **Lang:** Modern Greek; **Rel:** Christian. **Currency:** Drachmi US \$1=143.73.

Greece or the Hellenic Republic occupies the southern part of the Balkan peninsula in the Mediterranean with the Ionian Sea on the west and the Aegean Sea on the east. Albania, Yugoslavia and Bulgaria lie to the north of Greece, and Turkey to the east.

In ancient times, Greece was the seat of democracy, learning and culture. Politically



independent till the first century B.C., the Greek states succumbed to Roman might in the latter half of the first century B.C. Later they came under the Byzantine and Ottoman empires in succession until 1830 when Greece regained its freedom as a monarchic state. After many vicissitudes of fortune monarchy was abolished in Greece in 1974. It has been a republic since.

Greece having been till recently an agricultural country has now developed many industrial branches. In merchant shipping, Greece owns a surprisingly big tonnage. Tourism is Greece's biggest industry.

President: Christos Sartzetakis. **PM:** Andreas Papandreou.

Mission in India: Embassy of Greece, 16 Sunder Nagar, New Delhi- 110 003.

GRENADA

Cap: St. George's; **Area:** 344 sq.km.; **Pop:** 1,15,000; **Lang:** English and French-African patois; **Rel:** Christian; **Currency:** Eastern Caribbean \$. US \$1=EC \$2.70.

Grenada is the southernmost of British Windward Islands and includes *Southern Grenadines* (islands), the largest of which is *Carriacou*. It is a heavily wooded country with mountains of volcanic origin stretching from north to south. Grenada became independent in 1974.

The population is of mixed origin. European, Negro and Carib Indians.

Tourism is a growing industry but agriculture dominates the economy. The chief exports are cocoa, nutmegs and bananas. Other crops include coconuts, citrus fruits, sugar cane, cotton and spices.

Gov. Gen. Sir Paul Scoon **PM:** Herbert Blaize.

GUATEMALA

Cap: Guatemala City; **Area:** 1,01,889 sq.km. **Pop:** 81,65,000; **Lang:** Spanish (official) and Indian dialects; **Rel:** Christian; **Currency:** Quetzal US \$1=Q1.

A republic of central America, Guatemala is bounded by Mexico, Belize, Honduras, El-Salvador, the Caribbean Sea and the Pacific Ocean.

Guatemala is the third largest of the five central American states and has the largest population. Fifty per cent of the population is

of Indian (Red) extraction, 45 per cent Ladino or of mixed European and Indian parentage. The Indians are the descendants of the builders of the great Maya civilization which was wiped out by the Spanish conquistadors.

After remaining as a Spanish colony for about three centuries, Guatemala became a republic in 1939. Guatemala's claims to British Honduras (Belize) led to the rupture of diplomatic relations with Britain in 1963.

The soil is very fertile. Agriculture is the most important occupation. The principal crop is coffee. Other important export items are bananas, cotton, gum, sugar, maize, tobacco, fruits and beef.

President: Vinicio Cerezo.

GUINEA

Cap: Conakry; **Area:** 2,45,857 sq.km. **Pop:** 53,01,000; **Lang:** French and 8 national languages; **Rel:** Islam and Tribal; **Currency:** Syli US \$1=26 Sylis.

Guinea, a former French overseas territory in West Africa, is bounded by Guinea-Bissau, Senegal, Mali, the Ivory Coast, Liberia and Sierra Leone.

Under the constitution of the Fifth (French) Republic, Guinea voted for secession and proclaimed itself an independent republic on October 2, 1958.

It exports coffee, honey, bananas, palm kernels, iron and aluminium ore. Guinea has probably the world's largest deposit of bauxite.

President: Col. Lansana Konte. **P.M:** Col. Diarra Traore.

GUINEA-BISSAU

Cap: Bissau; **Area:** 36,125 sq.km. **Pop:** 8,44,000; **Lang:** Cnulo (Cape Verde-Guinea dialect) and Portuguese; **Rel:** Islam, Christian and Tribal; **Currency:** Peso. US \$1=88.53 Pesos.

Guinea-Bissau, formerly Portuguese Guinea, is stuck like a wedge between Senegal in the north and Guinea to the east and south. The Atlantic sea borders it on the west. The land is part plain and part plateau.

The main occupation is agriculture. Swamp rice (grown in the coastal plains), coconuts, cassava, sweet potatoes and maize form the important food crops. The cash

crops are groundnuts, coconuts and palm oil. Cattle raising is widespread.

Guinea-Bissau unilaterally declared independence in 1973. Portugal recognised its independence in 1974.

President: Maj. Joao Barnardo Vieira.

GUYANA

Cap: Georgetown; **Area:** 214,969 sq.km. **Pop:** 9,36,000; **Lang:** English (official) and Urdu; **Rel:** Christian and Hindu; **Currency:** Dollar. US \$1=4.12 G\$.

Guyana (former British Guiana) lies on the north east coast of South America. It is bounded on the east by Suriname, on the west by Brazil and Venezuela, and on the south by Brazil.

Guyana became a British possession in 1814 and an independent sovereign state within the Commonwealth of Nations on May 26, 1966.

The economy is based on agriculture. Sugar, rice and bauxite are the main exports. There are considerable deposits of gold and diamonds. Dense tropical forests cover much of the land.

President: Desmond Hoyle; **P.M:** Hamilton Greene.

Mission in India: High Commission of Guyana, 85 Poorvi Marg, Vasant Vihar, New Delhi-110 057.

HAITI

Cap: Port-au-Prince; **Area:** 27,750 sq. km.; **Pop:** 6,419,000; **Lang:** French (official), a Creole dialect is generally spoken; **Rel:** Christian and Voodoo; **Currency:** Gourde. US \$1=5 Gourdes.

Haiti is part of the West Indies known as Hispaniola in the Atlantic lying between Cuba on the west and Puerto Rico on the east. Negroes form the majority of the population, the rest being mulattoes descended from former French settlers and slaves. The French colony proclaimed itself an independent republic in 1804.

Coffee is the chief agricultural product, others being sisal, cotton, raw sugar, cocoa and tobacco. Rice is grown for home consumption. Rum and other spirits are distilled from molasses and exported. Bauxite is the chief mineral exported. Tourism is Haiti's second largest source of foreign exchange.

President: Jean Claude Duvalier.

HONDURAS

Cap: Tegucigalpa, D.C.; **Area:** 112,088 sq. km.; **Pop:** 4,232,000; **Lang:** Spanish; **Rel:** Christian; **Currency:** Lempira also Known as Peso US \$1=2 Lempiras.

Honduras is a republic of Central America lying between Nicaragua, El Salvador and Guatemala. It has a long northern coastline on the Caribbean and a narrow southern outlet to the Pacific.

Originally a Spanish colony, Honduras became independent in 1821. The country has gone through a series of dictatorship military juntas, coups and counter-coups.

The chief crop is bananas which constitute 65 per cent of the country's exports. Coffee, cotton, maize and tobacco are also grown. Timber is abundant and cattle raising is a major occupation.

President: Jose Azcona Hoyo

HONG KONG

Cap: Victoria, **Area:** 1051.7 sq. km.; **Pop:** 5,498,000; **Lang:** English and Cantonese; **Rel:** Confucianism and Buddhism; **Currency:** Hongkong Dollar. US \$1=HK\$ 7.80.

Lying along the south east coast of China, at the mouth of the Canton river, Hong Kong comprises Hong Kong island, Kowloon Peninsula, the New Territories and over 230 small islands. Hong Kong has been a British colony since 1843. The New Territories were acquired by Britain in 1898 by lease for 99 years. According to an agreement signed on 19 Dec. 1984, China would recover sovereignty over Hong Kong from 1 July 1997 and establish it as a Special Administrative Region.

The population is almost entirely Chinese with a sprinkling of other nationalities.



Eskimos Form Nation

Anchorage, Alaska: Describing themselves as "sovereign nations", Eskimos and Indians from 111 Alaskan villages have vowed to deal with American state and federal officials on a "Government-to-Government" basis.

"This is the rebirth of a nation", While Kasayulie, a leader of the sovereignty movement from the Western Alaska Eskimo town of Aklachak, said.

Aklachak villagers are dissolving their city council form of Government and replacing it with a centuries-old traditional tribal council.

Aklachak and neighbouring villages have formed the "Yupit nation" and established their own boundaries, tribal courts, school district and fish and game management region. The villages sued the state in federal court for cutting off state revenue sharing funds in response.

Based on the events at the United Tribes of Alaska congress, UTA chairman Charlie Kairaiuak said he expected native villages throughout Alaska to follow Akiachak's lead.

Most of Alaska's estimated 70,000 Eskimos, Indians and Aleuts live in 200 remote villages scattered around the state. When the UTA delegates began returning to their villages, they carried resolutions with them calling on tribes to take control of local affairs and to re-establish traditional tribal boundaries.

(UPI: Sept. 23, 1985)

Hong Kong is one of the world's greatest transshipment ports. It specialises in light industries—cotton textile, plastics, electronic, photographic and optical equipments etc.

Gov. Gen: Sir Eduard Youde, **Chief Secretary:** David Akers-Jones.

HUNGARY

Cap: Budapest; **Area:** 93,033 sq. km.; **Pop:** 10786000; **Lang:** Hungarian, Magyar; **Rel:** Christian; **Currency:** Forint, US \$1=52.73 Forints.

Hungary, a socialist country in Central Europe, lies between Czechoslovakia, Yugoslavia, the USSR, Romania and Austria. The eastern half of Hungary is mainly a great fertile plain, 'the Great Plain'. The west and the north are hilly.

Hungary had a stormy history being successively overrun by Huns, Magyars, Turks, Hungarians and Austrians. Hungary became an independent republic in 1918 and the Hungarian Socialist Republic in 1919.

Although an agricultural country in the past, industry has come to account for more than half of its total economy since the Second World War. Hungary exports engineering products, machine tools, motor

vehicles and electrical and electronic goods. Chief imports are iron ore, coal, crude oil and consumer goods. More than 97 per cent of agricultural land is collectivised. Vineyards occupy around 186,000 hectares.

Chairman of the Presidential Council: Pal Losonczy, **PM:** Gyorgy Lazar.

Mission in India: Embassy of Hungary, 2/50, Niti Marg, Chanakyapuri, New Delhi-110 021.

ICELAND

Cap: Reykjavik; **Area:** 102,846 sq. km.; **Pop:** 239000; **Lang:** Icelandic; **Rel:** Christian; **Currency:** Krona US \$1=Kr. 42.92.

Iceland is an island close to the Arctic Circle in North Atlantic. The Norwegian Sea is on the eastern side of Iceland. The warm Gulf Stream makes the winters mild. During the short cool summers, there is perpetual daylight for many weeks—making it an *island of the Midnight Sun*. The island has many geysers and hot springs. Natural hot water from Iceland's hot springs is pumped into towns, providing heat for offices and residences. Iceland has over 200 volcanoes, many of them still active.

The people of Iceland are the descendants of the dare-devil Vikings of Norway.

the first of whom settled in Iceland in A.D. 874 and who are reputed to have first discovered Greenland (A.D. 982) and North America (A.D. 1000). After having been independent till the 13th century it became part of Norway, and passed under Danish rule. In 1941 the Althing (Parliament) voted for complete independence and a republic was formed on June 17, 1944.

Much of the land in Iceland is uncultivated. Potatoes and turnips are the major crops. Fishing industry is highly developed and forms the mainstay of Iceland's economy.

President: Vigdis Finn Bogadottir.

Mission in India: Embassy of Iceland, D-35, Pamposh Enclave, New Delhi.

Consulate: Bombay— 38, Western India House, Sir P.M. Road.

INDIA

(See Part III)

INDONESIA

Cap: Jakarta; **Area:** 1,904,569 sq. km.; **Pop:** 162,167,000; **Lang:** Bahasa Indonesian; **Rel:** Islam; **Currency:** Rupiah. US \$1 = 1097 Rupiahs.

Indonesia is an archipelago state consisting of over 13,000 (6000 inhabited) islands. The five main islands are Java, Sumatra, Kalimantan (Indonesian Borneo), Sulawesi and Irian Jaya (West New Guinea) with 30 smaller archipelagoes. The capital is Jakarta, the former city of Batavia, on the island of Java. The country is divided into 27 provinces.

The Japanese army occupied Indonesia from 1942 till 1945 after the surrender of the Dutch army. The Indonesian people proclaimed their independence on August 17, 1945. After a war of independence, the Netherlands transferred the sovereignty to Indonesia on December 27, 1949.

One of the world's richest countries in natural resources, Indonesia has vast supplies of tin, oil and fairly big deposits of bauxite, copper, nickel, gold and silver. Agriculture is the main occupation of the people. Crops include rice, tobacco, coffee, rubber, pepper, kapok, coconut, palm oil, tea and sugarcane. Forest products are a major source of foreign exchange.

Pres., PM & Def. Minister: Gen. Suharto.

Mission in India: Embassy of Indonesia, 50-A, Chanakyapuri, New Delhi- 110021.

Consulate: Bombay— Lincoln Annexe, 17, Altamount Road, Cumballa Hill.

Calcutta: Rajkamal Bhavan, 128 Rashbehari Ave.

IRAN

Cap: Teheran; **Area:** 1,648,000 sq. km.; **Pop:** 43,799,000; **Lang:** Persian (Farsi) **Rel:** Islam; **Currency:** Rial. US \$1 = 97.21 Rial.

Iran (Persia) is surrounded by Iraq and Turkey in the west, USSR in the north, Afghanistan and Pakistan in the east and Persian Gulf in the south west. The southern coast of the Caspian Sea lies to the north of the country. The Iranians are Aryans.

It is a country of great antiquity, celebrated alike for its culture and military valour.

The last of the Pahlavi dynasty, Mohammed Reza, was forced to flee Iran in face of nation-wide revolt against him. In Feb. 1979 Ayatollah Khomeini, a highpriest of Islam, returned to Iran to guide its destiny.

Agriculture is the major occupation of the people. The chief agricultural products are wheat, barley, rice, fruits, wool and sugar beets. Sturgeon fish (from which caviar is obtained) in Caspian Sea provides an important source of income. Iran is one of the biggest oil producing regions in the Middle East. Emeralds and other gems are found in Khorassan and Kerman. Persian carpets, made on handlooms are famous the world over.

President: Ayatollah Hoiatoleslam Ali Khamenei. **P.M:** Mir Hussein Musavi.



Mission in India: Embassy of Iran, 5, Barakhamba Road, New Delhi- 110001.

IRAQ

Cap: Baghdad; **Area:** 438446 sq. km; **Pop:** 15158000; **Lang:** Arabic (official) and Kurdish; **Rel:** Islam; **Currency:** Iraqi Dinar. US \$1=0.311 Dinar.

Iraq is the modern name for Mesopotamia (Meso - middle, Potamia- rivers), the land lying between the two great rivers, Euphrates and Tigris. It is surrounded by Iran on the east, Saudi Arabia, Kuwait and the Arabian (Persian) Gulf on the South, Jordan and Syria on the west and Turkey on the north.

Iraq is one of the most ancient countries of the world and has produced a culture—the Mesopotamian Civilisation—which has influenced European and Asian civilisations.

Petroleum is the most important sector of the economy. Iraq occupies the fifth place among oil-producing countries of the world. A programme of industrialisation is on with the oil revenues. Three quarters of the population depend on agriculture for their living. Iraq is the world's largest exporter of dates.

President: Saddam Hussein Takriti.

Mission in India: Embassy of Iraq, 169/170/171, Jor Bagh, New Delhi 110003.

Consulate: Bombay— Panorama, 203, Wal-keshwar Road.

IRELAND

Cap: Dublin; **Area:** 70,282 sq. km; **Pop:** 3555000; **Lang:** Irish and English; **Rel:** Christian; **Currency:** Irish Pound. US \$1=1R£ 0.98.

Ireland or Eire, the Emerald Isle, is an island in the N. Atlantic lying west of Great Britain.

The independent state of Ireland consists of only 26 counties out of the 32 that make up the whole island. The 6 remaining counties form the area known as Northern Ireland which is directly administered by the United Kingdom.

Ireland emerges into history with the coming of St. Patrick in 432 A.D. and the spread of Christianity. An invasion led by Norman barons during the 12th century led to a period of almost eight centuries of British

rule in Ireland. In 1921 Great Britain recognised Ireland as a more or less independent unit within the Commonwealth and the country became known as the Irish Free State. In 1932 the Fianna Fail party under Eamon de Valera came to power and gradually removed the last vestiges of allegiance to the British Crown. In 1937 a new constitution was adopted which made Ireland effectively a republic. In 1949 Ireland formally declared itself a Republic and ceased to be a member of the Commonwealth. In 1973 the country joined the EEC.

Ireland had formerly a mainly agricultural economy. However, in recent decades industrial output has expanded rapidly due to increased foreign investment. Exports make up 50% of GNP, the main items being dairy products, food and beverages, machinery and live animals.

President: Patrick John Hillery; **PM:** Dr. Garret Fitzgerald.

Mission in India: Embassy of Ireland, 13 Jor Bagh, New Delhi- 110 003.

Consulate: Bombay— 114, Shahid Bhagat Singh Road.

ISRAEL

Cap: Jerusalem; **Area:** 20,325 sq. km; **Pop:** 4216000; **Lang:** Hebrew (official) and Arabic; **Rel:** Judaism; **Currency:** Shekel US \$1=783 Shekel.

A republic of the Middle East (West Asia), Israel is surrounded on three sides by Arab countries. On the north is Lebanon, on the east Syria and Jordan and on the south Egypt. The Mediterranean Sea lies to the west.

The republic occupies the minor portion of ancient Palestine.

On November 29, 1947, the UN partitioned Palestine between the Jews and the Arabs. A new Zionist state called Israel was proclaimed in the Jewish area of Palestine on May 15, 1948.

Israel has developed both agriculture and industry in the little land allotted to it with considerable expertise and efficiency. They have literally made the deserts bloom. Kibbutzim (collective cultivation), irrigation schemes and reclamation of desert-land formed the main features of agricultural development. Citrus fruits are the main exports. Wine-making is an extensive indus-

try. In diamond-cutting, Israel comes next only to Belgium. The Valley of Jordan and the Dead Sea yield rock salt, sulphur and potash.

President: Chaim Herzog, **P.M.:** Shimon Peres.

ITALY

Cap: Rome; **Area:** 301,253 sq. km; **Pop:** 56724000; **Lang:** Italian; **Rel:** Christian; **Currency:** Lira US\$1=2235.

The Italian Republic occupies the long peninsular area in Europe extending from the Alps into the Mediterranean Sea. The peninsula is bounded by the Mediterranean on 3 sides. France bounds it on the north-west, Switzerland and Austria on the north and Yugoslavia on the north-east. The islands of Sicily, Sardinia, Elba and Capri in the Mediterranean belong to Italy.

Italy, once the headquarters of the great Roman Empire, disintegrated into many petty states during the later Middle Ages. Modern Italy began to develop when King Victor Emmanuel II of Savoy became King. The Vatican was recognised as an independent state on February 11, 1929. On April 28, 1945 Mussolini the Fascist dictator was put to death. Consequent on a referendum on June 2, 1946, Italy voted for a republic. The King laid down his kingship.

Since World War II, Italy has revolutionised agricultural production. The chief crops are grapes, wheat, sugarbeet, fruit and vegetables. Italy is among the highly industrialised countries of the world. Its main products are electrical, mechanical and electronic gadgets, automobiles and chemicals. Italy has a big merchant marine fleet with a gross tonnage of over 11 million, and air fleet with the capacity of over 12 billion passengers/km and over 1 billion tons/km.

President: Francesco Cossiga, **P.M.:** Bettino Craxi.

Mission in India: Embassy of Italy, 13, Golf Links, New Delhi- 110 003.

Consulates: Bombay— Consulate General of Italy, Vaswani Mansion, 120, Dinsha Wacha Road.

Calcutta: 3, Raja Santosh Road, Alipore.

Madras: 138, Mount Road.

IVORY COAST

Cap: Abidjan; **Area:** 322,462 sq. km; **Pop:** 9474000; **Lang:** French (official) and Tribal;

Rel: Muslim and Christian; **Currency:** Franc CFA. US\$1=523.75 F CFA.

The Ivory Coast is bordered by Mali and Burkina Faso in the north, Ghana in the east, the Gulf of Guinea in the south, and Liberia and Guinea in the west.

The Republic of Ivory Coast, once an overseas territory of France, became independent in August 1960.

Agriculture, forestry and fishing employ 90 per cent of the population. Ivory Coast is the third most important coffee producer in the world and the most important African producer of timber. Cocoa, bananas and pineapples are the other important cash crops.

President: Felix Houphouet-Boigny.

JAMAICA

Cap: Kingston; **Area:** 10,991 sq. km; **Pop:** 2290000; **Lang:** English; **Rel:** Christian; **Currency:** Dollar US\$1=J\$ 5.17.

Jamaica, an island in the Greater Antilles group of the West Indies, is situated in the Caribbean Sea, 144 km. south of Cuba. The climate varies with altitude, being tropical at sea-level and temperate in the mountain area.

Jamaica was visited by Columbus in 1494 and ruled by Spain till 1655 when Britain occupied it. In 1962 Jamaica became fully independent as a member of the Commonwealth.

Agriculture, mining and tourism form the backbone of the economy. The dominant crop is sugar, with molasses and rum as important by-products. Bananas, citrus fruits and coconuts are also grown. Jamaica is the world's second largest producer of bauxite and alumina. Other industries are cement, tobacco and consumer goods.



Vatican-Italy Historic Pact



The Vatican and Italy ratified a historic pact on June 3, 1985 ending Roman Catholicism as a State religion in Italy.

Pope John Paul II said the new Church-State treaty, known as a Concordat, was a sign that Catholicism respected Italy's independence, but he added that the Church reserved the right to speak out on political and moral issues.

The new treaty replaces the Lateran pact of 1929, which was negotiated by Mussolini and created the independent State of Vatican City on 109 acres of land in Rome.

For 11 centuries, the Pope had held secular authority over the Papal States, a country that cut a swath through Central Italy. But the Vatican was deprived of its land in 1870 as part of the unification of Italy under the royal House of Savoy. The Pope refused to recognise the loss, and the issue was resolved only in 1929 with the Lateran Treaty.

The new accord affirms the independence of Vatican City, but ends a number of privileges the Catholic Church had in Italy, including its status as the State Church.

Although more than 90 per cent of

Italians are baptised Catholics, only 30 per cent attend Sunday mass. In two tests over the last decade, voters rejected pressure from the Catholic hierarchy and supported legalising divorce and abortion.

The new treaty guarantees religious freedom for non-catholics and ends Rome's status as a sacred city. This title had permitted the Vatican to object to strip-ease parlours and pornography shops and had on occasion led to the banning of books or plays offensive to Catholicism. In recent years, the Vatican had been making less use of the significance of Rome to Roman Catholicism.

It also establishes stricter rules on tax exemptions for religious institutions and gradually ends state subsidies for members of the clergy. These will end in 1990, though the accord provides tax benefits to Italians who contribute to paying clerical salaries.

Another provision ends compulsory Catholic instruction in public schools, though it can continue on an optional basis. Parents used to need special permission to exempt children. Now parents will be asked annually whether they want their children to receive religious instruction.

(New York Times: June 12, 1985)



Head of State: Queen Elizabeth II. **Gov. Gen:** Florizel Augustus Glasspole. **P.M:** Edward Seaga.

JAPAN

Cap: Tokyo, **Area:** 377,535 sq. km; **Pop:** 119,492,000; **Lang:** Japanese; **Rel:** Shinto and Buddhist; **Currency:** Yen. US \$1 = 261.77 Yen.

Japan consists of four main islands, Honshu (Mainland), Hokkaido, Kyushu and Shikoku and a number of smaller islands of which Okinawa is one. Japan is separated from the Soviet Union and Korea by the Sea of Japan and from China by the East China Sea. Japan has a deeply indented coastline measuring 16,654 miles. Most important ports are Yokohama, Kobe, Nagoya and Osaka.

Main Islands of Japan

Name	Area (sq. km)	Major city.
Honshu	22,414	Tokyo
Hokkaido	78,073	Sapporo
Kyushu	36,555	Kitakyushu
Shikoku	18,257	Matsuyama

Legend has it that the Japanese Empire was founded by Emperor Jimmu in 660 B.C. However, there was no centralised authority till A.D. 1868 when Emperor Meiji united the whole of Japan under his rule. Japan had little trade relations with foreign countries until Commodore Perry of USA in 1854 persuaded the Japanese to enter into a trade treaty with USA. In 1889 Japan had her first constitution. Japan's victory in the Russo-Japanese War of 1904-05 raised her prestige among European powers.

Rice, the staple food of Japan, is cultivated in half the area of arable land. Other crops are wheat, barley, potatoes and tobacco. Except for limestone and sulphur, Japan is poor in minerals and Japanese industry is heavily dependent on imported raw materials and fuels. Japan is one of the most industrially advanced countries of the world. The principal industries are motor vehicles, iron and steel, chemicals, textiles (cotton, wool, silk and synthetics), fishing, ceramics, precision instruments, fertilizers, machinery and shipbuilding. Japan has evolved an extensive fishing industry.

Head of State: Emperor Hirohito, **P.M:** Yasuhiro Nakasone.

Mission in India: Embassy of Japan, Plot 450 G, Shantipath, Chanakyapuri, New Delhi-110 021.

Consulate: Bombay— 1, M.L. Dahanukar Marg, Cumballa Hill.

Calcutta: 12, Pretoria Street.

Madras: 60 Spur Tank Road.

JORDAN

Cap: Amman; **Area:** 97,740 sq. km; **Pop:** 3,375,000; **Lang:** Arabic; **Rel:** Islam; **Currency:** Dinar. US \$1 = JD 0.453.

A constitutional monarchy in south-west Asia, Jordan is bounded in the north by Syria, north east by Iraq, east and south by Saudi Arabia and west by Israel.

Jordan was popularly known as Trans-Jordan till 1949, when the popular name was changed to the Hashemite Kingdom of Jordan. The population is chiefly Arab of whom the majority are Muslims. In 1946, Jordan became an independent state.

Jordan is largely a desert area, but the western portion is fertile and produces citrus fruits, wheat, barley, lentils, and water melons. Phosphates make up the country's most important export item, but tourism remains its main foreign exchange earner.

Head of State: King Hussein Ibn Talal
P.M: Ahmed Obaidat.

Mission in India: Embassy of Jordan, 35, Malcha Marg, Chanakyapuri, New Delhi-110 021.

Consulate: Bombay— Mittal Court 'C' wing, 10th Floor, Room No. 105, Nariman Point.

KAMPUCHEA

Cap: Phnom-Penh; **Area:** 181,035 sq. km; **Pop:** 7,149,000; **Lang:** Khmer; **Rel:** Theravada Buddhism; **Currency:** Riel.



The Democratic Kampuchea was originally called *Cambodia* and for some time—between Oct. 1970 and May 1975—was known as Khmer Republic. It is a south-east Asian state bounded by Thailand and Laos on the north, by Vietnam on the east and south and by the Gulf of Siam on the south and west. Democratic Kampuchea represents the last remains of the great Khmer Empire.

Kampuchea is an undeveloped country with 50 per cent of its land covered by virgin forests. Rice occupies 80 per cent of the cultivated area. Cattle rearing and fishing are fairly well developed. The forests are rich in valuable timber. Iron, copper, manganese and gold are also found.

President: Heng Samrin, **P.M.:** Hunsen.

KENYA

Cap : Nairobi; **Area:** 582,646 sq. km; **Pop:** 19761000; **Lang:** Swahili; **Rel:** Tribal and Christian; **Currency:** Shilling. US \$1=15.57 Shilling.

The Republic of Kenya is bordered on the north by Sudan and Ethiopia, east by Somalia and the Indian Ocean, south by Tanzania and west by Uganda.

Formerly a British colony, Kenya became an independent republic within the Commonwealth in 1964.

Kenya's prosperity rests largely on agricultural products. The chief cash crops are coffee, tea, sisal, cereals, wattle, and pyrethrum. Kenya is one of the few African countries with an important dairy industry. Mineral industries are being organised. Tourism has expanded considerably.

President: Daniel Arap Moi.

Mission in India: High Commission of Kenya, 66, Vasant Marg, Vasant Vihar, New Delhi- 110 057.

KIRIBATI

Cap: Tarawa; **Area:** 861 sq. km; **Pop:** 60302; **Lang:** Gilbertese and English; **Rel:** Christian; **Currency:** Dollar.

Gilbert Islands, till recently a British colony, became independent under the name Kiribati (pronounced Kiribas) on July 11, 1979.

These islands, spread over a vast area in the Western Pacific, number around 33. All islands except Ocean Island (Banaba) are

low atolls with coconuts, pandanus and bread fruit forming the main vegetation. The population is Micronesian and Polynesian. Agriculture and fishing are the main occupations. Ocean Island has high grade phosphatic deposits which are being mined and exported. Copra is the other major export item.

President: Ieremia Tabai.

KOREA (North)

Cap: Pyongyang; **Area:** 1,20,538 sq.km. **Pop:** 1,96,30,000; **Lang:** Korean; **Rel:** Buddhist and Confucian; **Currency:** Won. US \$1=0.94 Won.

The Democratic People's Republic of Korea occupies the northern part of the Korean peninsula. It lies between the Yellow Sea and the Sea of Japan. China is in the north.

During the Second World War, America occupied South Korea and Russia, North Korea. At the Potsdam Conference, the 38th parallel of latitude was recognised as the line of division between the occupation areas of Russia and America. North Korea was formed into the Democratic People's Republic of Korea on Sept. 9, 1948.

All industries were nationalised and land distributed among the peasants. Agriculture has since been collectivised. Industrial development has concentrated on heavy industry, electricity, metallurgy, machinery and chemicals. The country is rich in coal and iron and many non-ferrous metals. It is one of the five leading countries of the world in the production of tungsten, graphite and magnetite.

President: Kim Il Sung, **PM:** Kang Song San.

Mission in India: Embassy of the Democratic Peoples' Republic of Korea, 42-44 Sunder Nagar, New Delhi-110 003.

KOREA (South)

Cap: Seoul; **Area:** 98,859 sq.km.; **Pop:** 4,03,09,000; **Lang:** Korean; **Rel:** Christian and Confucian; **Currency:** Won US \$1=843.80 Won.

The Republic of Korea forms the southern part of the Korean peninsula. It is bounded on the north by the Democratic People's Republic of Korea, on the east by the Sea of Japan and on the west by the Yellow Sea.

The Republic of Korea was formally proclaimed on August 15, 1948.

Agriculture is the mainstay of the economy. The chief crop is rice. Wheat, barley and potatoes are also cultivated. Fish is both an export item and a source of food. There are substantial coal deposits. Other minerals include iron, tungsten, graphite and fluorite. New industries have been started, notably in textiles, electronics, steel and petrochemicals.

President: Gen. Chun Du Hwan; **P.M.:** Lho Shin Yong.

Mission in India: Embassy of Republic of Korea, 9 Chandragupta Marg, Chanakyapuri, New Delhi-110 021.

KUWAIT

Cap: Kuwait City; **Area:** 17,656 sq.km.; **Pop:** 17,03,000; **Lang:** Arabic and English; **Rel:** Islam; **Currency:** Dinar. US\$1=KD 0.307.

Kuwait, a small Arab state, is on the north western coast of the Persian Gulf between Iraq and Saudi Arabia. Kuwait is one of the richest countries in the world.

Kuwait was traditionally under the rule of the Al-Saban dynasty, founded in 1756. It became an independent state on June 19, 1961.

Kuwait is the world's fourth largest producer of petroleum.

Amir: Shaikh Jabir al-Ahmad al-Jabir al-Sabah. **PM:** Shaikh Saad al-Abdullah al-Salem al-Sabah.

Mission in India: Embassy of Kuwait, 5-A, Shantipath, Chanakyapuri, New Delhi-110 021.

LAOS

Cap: Vientiane; **Area:** 2,36,880 sq.km. **Pop:** 43,15,000; **Lang:** Laotian & Tribal; **Rel:** Buddhist; **Currency:** Kip. US\$1=K35.

Laos-Lao People's Democratic Republic occupies a strategic position in south east Asia, bounded on the north by China, on the east by Vietnam, on the south by Kampuchea, on the west by Thailand and on the north west by Burma. Laos became an independent republic in 1949.

The chief products are rice, tobacco, cotton, benzoin, shellac, tin, lead, zinc and teak wood. Other industries exist but on a very small scale.

President: Prince Souphanouvong; **PM:** Kaysone Phoumvihan.

Mission in India: Embassy of Laos, 20 Jor Bagh, New Delhi-110 003.

LEBANON

Cap: Beirut; **Area:** 10,400 sq.km.; **Pop:** 26,44,000; **Lang:** Arabic; **Rel:** Christian and Muslim; **Currency:** Pound. US\$1=£Leb. 18.75.

The Republic of Lebanon occupies a strip of land along the Mediterranean coast between Syria and Israel. Lebanon became independent in 1941.

Primarily an agricultural country, Lebanon produces olive oil, grain and fruits. The chief industries are oil refining, food processing and cement. Tourism is a valuable source of income.

President: Amin Gemayel. **PM:** Rashid Karami.

Mission in India: Embassy of Lebanon, 10, Sardar Patel Road, New Delhi-110 021.

Consulate: Calcutta- 27A, Camac street.



LESOTHO

Cap: Maseru; **Area:** 30,355 sq.km. **Pop:** 14,81,000; **Lang:** English and Sesotho; **Rel:** Christian and Tribal; **Currency:** Loti (Plural Maloti) US\$1=2.06 Maloti.

The Kingdom of Lesotho is an enclave within the Republic of South Africa. Lesotho was a British protectorate under the name Basutoland. It became independent as Lesotho on Oct. 4, 1966.

The principal occupation is agriculture. Lesotho possesses water and hydro-electric resources of great potential. Live-stock, diamonds, wool and mohair are the main exports.

Head of the State: King Moshoeshoe.
PM: Chief Leabua Jonathan.

LIBERIA

Cap: Monrovia; **Area:** 1,11,369 sq.km. **Pop:** 21,23,000; **Lang:** English and Tribal; **Rel:** Christian. **Currency:** Dollar. US\$1=1 Liberian \$.

This independent republic lies on the Atlantic coast with Sierra Leone on the north-west. Guinea on the north and Ivory Coast on the east.

Liberia was founded in 1822 and declared a republic on July 26, 1847.

About 90 per cent of the population is engaged in agriculture, much of it at subsistence level. Main crops are cassava, coffee, cocoa and palm oil. Iron ore and rubber are the main exports.

President: Maj. Gen. Samuel Kanyon Doe.

LIBYA

Cap: Tripoli; **Area:** 17,59,540 sq.km; **Pop:** 34,71,000; **Lang:** Arabic; **Rel:** Islam; **Currency:** Dinar. US\$1=LD 0.30.

The Libyan Arab Republic changed its name to Jamahiriya meaning State of the Masses in March 1977. An Arab state on the north coast of Africa, Libya is bounded by Egypt, Sudan, Tunisia, Algeria, Niger and Chad.

Formerly an Italian colony, Libya became an independent state in 1949.

The main agricultural products are dates, olives, almond and citrus fruits. Fishing, tobacco processing, dyeing and weaving are the important industries. Oil was discovered in 1957 and today Libya is one of the leading producers of oil in the world.

Head of the State: Col. Muamar Ghaddafi.

Mission in India: Embassy of Libya, 22, Golf Links, New Delhi-110 003.

LIECHTENSTEIN

Cap: Vaduz; **Area:** 160 sq.km. **Pop:** 26,512; **Lang:** German; **Rel:** Christian; **Currency:** Swiss Franc.

Liechtenstein is a small state on the upper Rhine, between Austria and Switzerland. It measures 24 km from north to south and 9 km from east to west. It became an independent

kingdom in 1866.

The economy is mainly industrial. Chief industries are machines and tools, textiles, foodstuffs and leatherware.

Head of State: Prince Franz Josef. **PM:** Hans Brunhart.

LUXEMBOURG

Cap: Luxembourg-ville (Lutzelburg); **Area:** 2586 sq.km.; **Pop:** 3,63,000; **Lang:** French; **Rel:** Christian; **Currency:** Franc.

Luxembourg is a small state lying in between Germany, Belgium and France. It is a Grand Duchy.

Its independence was confirmed by the Treaty of London in 1867.

As a member of the European Economic Community, the Benelux, the European Steel and Coal Community and the Euratom, Luxembourg is a highly industrialised state. Its iron deposits form the basis of a big steel industry, which accounts for 70 per cent of the country's exports. Agriculture occupies only 10 per cent of the population.

Head of the State: Grand Duke Jean.
President: Jacques Santer.

MACAO

Cap: Macao; **Area:** 15.5 sq.km. **Pop:** 2,61,680; **Lang:** Portuguese and Cantonese; **Rel:** Confucian; **Currency:** Pataca HK \$100=103 Patacas.

Macao or Macau is a tiny Portuguese possession in South China, at the mouth of the Sinkiang river. The territory consists of the Macao peninsula and the adjoining islands of Taipa and Coloane. China has permitted Macao to continue as an independent territory mainly because of the big entrepot trade it commands. Macao is a free market for gold and an infamous centre of smuggling and gambling.

The population is almost entirely Chinese. Industry, once restricted to matches and fireworks, now includes plastics, textiles, cameras, binoculars and such other consumer items. Cultivation is sparse. Only rice and vegetables are grown.

Governor: Cdr. Vscó Almeida e Costa.

MADAGASCAR

Cap: Tananarive; **Area:** 5,87,341 sq.km. **Pop:** 97,31,000; **Lang:** Malagasy and French;

Rel: Islam; **Currency:** Franc. US \$1=719.84 FMG.

Madagascan, formerly a French overseas territory, is a large island about 500 km long off the coast of Mozambique. It became independent in 1960.

The economy is essentially agricultural. Rice is the staple food and coffee the chief export. Tobacco, cloves and vanilla are also cultivated. Large herds of cattle are raised. Mineral deposits include graphite, mica, nickel and copper. Since 1960, chromite is being mined.

President: Comdr. Didier Ratsiraka; **PM:** Lt. Col. Desire Rakotoarijaona.

MALAWI

Cap: Lilongwe; **Area:** 1,18,784 sq.km. **Pop:** 67,88,000; **Lang:** English and Chichewa; **Rel:** Tribal and Muslim; **Currency:** Kwacha. US \$1=K1.64.

Malawi is bounded by Tanzania, Mozambique and Zambia. Lake Nyasa lies on its eastern side. A land of lakes and mountains. Malawi has infinite beauty and is considered a tourists' paradise. Malawi, formerly Nyasaland, became independent in 1966.

Poor in resources, Malawi's agriculture is still at a subsistence level. The chief cash crops are tea and tobacco, sugar and cotton.

President: Hastings Kamuzu Banda.

MALAYSIA

Cap: Kuala Lumpur; **Area:** 3,30,435 sq.km. **Pop:** 1,52,04,000; **Lang:** Bahasa Malaysia; **Rel:** Muslim, Buddhist. **Currency:** Ringgit. US\$1=2.60 Ringgit.

Malaysia consists of 11 Malaysian states and the Borneo states of Sarawak and Sabah (North Borneo). Malaya, on the Malay Peninsula, is bordered on the east by the South China Sea, on the south by the Straits of Johore, on the west by the Straits of Malacca and the Andaman Sea, and on the north by Thailand. The population of Malaysia is mixed. The Malays proper account for about 54.1 per cent of the population, the Chinese for about 33.4 per cent and the Indian for about 10.1 per cent and 1.4 per cent others. The Federation of Malaysia was formally inaugurated in 1963.

Malaysia is the world's leading producer of rubber and also the world's major producer of tin, providing about 40 per cent of the world output. Iron ore, gold, ilmenite and bauxite form other major mineral resources. Oil production is becoming important. Industries include textiles, electronic equipment, chemicals and machinery.

Supreme Head of State: Sultan Mahmood Iskandar Ibni Al-Marhum Sultan Ismail. **P.M.** Dr. Mahathir bin Mohammed.

Mission in India: High Commissioner of Malaysia, 50-M Satya Marg, Chanakyapuri, New Delhi-110 021.

Consulate: Madras—No. 23, Khader Niwas, Khan Road.

MALDIVES

Cap: Male; **Area:** 298 sq.km. **Pop:** 1,68,000; **Lang:** Divehi; **Rel:** Islam; **Currency:** Rufiyaa (Maldivian Rupee).

Maldives (literally, islands of Male—from the Sanskrit 'dweep' meaning island) is an archipelago in the Indian Ocean, to the southwest of India and west of Sri Lanka. The archipelago consists of 12 coral atolls and about 2000 small islands. It extends for about 300 miles north to south.

The Maldives attained independence on July 26, 1965. It became a republic in November, 1968.

Most of the people are seafarers. Coconuts, fruits and millet are the main crops. The chief occupation is fishing and production of processed fish is the main industry.

President and P.M.: Maumoon Abdul Gayoom.



MALI

Cap: Bamako; **Area:** 12,39,998 sq.km. **Pop:** 78,25,000; **Lang:** French (official); **Rel:** Muslim and Tribal; **Currency:** Mali Franc. French Fl=50 Francs CFA.

Mali is a land-locked state in West Africa, bounded by Algeria on the north, Mauritania and Senegal on the west, Guinea and Ivory Coast on the south and Burkina Faso and Niger on the east. It was proclaimed an independent republic in 1960.

The country is poor in natural resources. Only about 20 per cent of the land is cultivable. The main crops are rice, millet and groundnuts. Livestock-raising is important and the processing of hides and skins remains the only industry. There is extensive river-fishing and good export trade in dried and smoked fish.

President and P.M.: Moussa Traore.

MALTA

Cap: Valletta; **Area:** 316 sq.km. **Pop:** 3,80,000; **Lang:** Maltese and English; **Rel:** Christian; **Currency:** Lira Malija. US\$1=Lm 1.95.

Malta is an island in the central Mediterranean Sea, 58 miles from Sicily and about 180 miles from the African coast. This state also includes the adjoining islands of Gozo and Comino. Malta became an independent republic in 1964.

The rocky country has no natural resources. Textiles, footwear, rubber products and plastics are now exported. Agricultural products include onions, potatoes and tomatoes. Tourism, however, remains the island's major industry.

President: Agatha Barbara. **P.M.:** Dr. Karmenu Mifsud Bonnici.

MAURITANIA

Cap: Nouakchott; **Area:** 10,30,700 sq.km.; **Pop:** 18,32,000; **Lang:** Arabic and French (official); **Rel:** Islam; **Currency:** Ouguiya. US\$1=67.16 Ouguiya.

The Islamic Republic of Mauritania is on the Atlantic coast of the West African bulge. It is bordered by Morocco, Algeria, Mali and Senegal.

Mauritania, a former French overseas territory, became autonomous in 1958 and

fully independent in 1960.

The population is traditionally nomadic rearing cattle and sheep. Fishing is important. Important deposits of iron and copper have been sighted and are being exploited. Oil prospecting goes on.

President and P.M.: Lt. Col. Mohamed Khouna Ould Haydalla.

MAURITIUS

Cap: Port Louis; **Area:** 2040 sq.km.; **Pop:** 10,31,000; **Lang:** English, French and Hindustani; **Rel:** Hindu, Christian and Muslim; **Currency:** Rupee. US\$1=Rupees 16.84.

Mauritius lies about 500 miles east of Madagascar in the Indian Ocean.

It became an independent state on March 12, 1968.

The island is an extreme example of one-crop economy, sugarcane being the only crop that supports the economy. Molasses, tea and tobacco are exported. In recent years, rapid advance has been made in the field of import substitution and export oriented industries.

Head of State: Queen Elizabeth II. **Gov. Gen:** Sir Seewoosagur Ramgobin. **P.M.:** Aneerood Jugnauth.

Mission in India: High Commission of Mauritius, 5 Kautilya Marg, Chanakyapuri, New Delhi-110 021.

MEXICO

Cap: Mexico City; **Area:** 19,72,547 sq.km.; **Pop:** 7,70,40,000; **Lang:** Spanish; **Rel:** Christian; **Currency:** Peso. US\$1=203 Pesos.

A federal republic of middle America, Mexico is bounded by the US, Belize and Guatemala. The Gulf of Mexico and the Gulf of Campeche are in the east while the Pacific Ocean and the Gulf of California are in the west. Mexico became an independent state in 1911.

Mexico is well suited for agriculture but is obliged to import food. The important agricultural products are maize, rice, wheat and sugar. Sea fishing is also important as an occupation. Mexico is one of the world's leading producers of silver and sulphur. Other minerals include coal, zinc, lead, manganese, bauxite and uranium. Oil also is drilled.

President: Miguel de la Madrid Hurtado.

Mission in India: Embassy of Mexico, 10 Jor Bagh, New Delhi-110 003.

MONACO

Cap: Monte Carlo; **Area:** 1.81 sq.km. **Pop:** 27,063; **Lang:** French & Monegasque; **Rel:** Christian; **Currency:** Franc.

Monaco is a sovereign principality on France's south-eastern Mediterranean coast.

The principality is a series of connected towns—Monaco-Ville, La Condamine, Fontvieille and Monte Carlo with its casino, opera house, grand hotels, shops and villas.

Monaco is a fashionable pleasure resort visited by thousands of tourists every year. Its main attractions are the gambling casino and its international motor sports—the Monte Carlo Rally and the Monaco Grand Prix. Tourism, gambling, taxes and tobacco monopoly are its main sources of income.

Head of State: Prince Rainier III.

Mission in India: Consulate General of Monaco, 114, Sundar Nagar, New Delhi-110 003.

MONGOLIA

Cap: Ulan Bator; **Area:** 15,65,000 sq.km.; **Pop:** 18,51,000; **Lang:** Mongolian; **Rel:** Buddhist and Lamaism; **Currency:** Tugrik. US\$1=3.36 Tugrik.

The Mongolian People's Republic lies in Central Asia with the Soviet Union to the north and China to the south, east and west. It became an independent state in 1921.

Livestock-raising is the principal occupation and comprises horses, oxen, sheep, goats and camels. The herdsmen are organised in collectives. State farms, of which there were 49 in 1980, practise large-scale agriculture. Minerals include coal, flourspar, tungsten, tin and copper.

Chairman of the Presidium: Dr. Jambyn Batmunkh. **P.M.:** D. Maydar.

Mission in India: Embassy of Mongolia, 34, Golf Links, New Delhi-110 003.

MONTSERRAT

Cap: Plymouth; **Area:** 102 km; **Pop:** 12,074; **Lang:** English and Patois; **Rel:** Christian;

Currency: Dollar.

Montserrat, like Antigua, is one of the Leeward Islands. Its population is of mixed European-Negro origin. Europeans proper form a minority. Agriculture is the mainstay of the people. Sea island cotton and vegetables like tomatoes form the main exports.

It is a British Associate State with full internal autonomy.

Gov: A.C. Watson; **Chief Minister:** Dr. J.A. Osborne.

MOROCCO

Cap: Rabat; **Area:** 8,00,000 sq.km; **Pop:** 2,28,48,000; **Lang:** Arabic; **Rel:** Islam; **Currency:** Dirham. US\$1=9.95 DH.

The Kingdom of Morocco, which is a constitutional, democratic and social Monarchy, is situated at the extreme northwest of Africa. It is bordered by Algeria in the east and Mauritania in the south, the North Atlantic Ocean in the west and the Mediterranean Sea in the north. The Atlas mountains stretch across Morocco.

Morocco recovered its political independence from France on March 2, 1956, and gained control over the Northern Spanish zones in 1958.

Primarily an agricultural country, Morocco produces cereals, including barley, wheat and corn. Vineyards are abundant and dates form a regular crop. Livestock raising is important and fishing is well-developed. The most important mineral extracted is phosphate, of which Morocco remains a world supplier. Other minerals are iron ore, coal, lead and manganese.

Head of State: King Hassan II. **P.M.:** Mohamed Karim Lamrani.



Polisario Recognised

The Government of India announced on Oct. 1, 1985 its recognition of the Sahrawi Arab Democratic Republic (SADR) set up by the Polisario in Western Sahara, a territory that came under Morocco's control after Spain withdrew from there.

The decision was taken by the Prime Minister, Rajiv Gandhi, after careful consideration of various aspects of this controversial issue affecting India's relations with Morocco which was claiming this territory and Algeria that was actively supporting the Polisario-led struggle for its independence.

At one stage India had declared that it would abide by the decision of the Organisation of African Unity (OAU) which, along with the U.N., has been supporting the move for an international study of the situation.

As a sequel Morocco broke diplomatic relation with India.

The new Republic is headed by President Mohamed Abde Aziz (who is also Secretary-General of the Polisario Front) and P.M. Mohamed Lamine.



MOZAMBIQUE

Cap: Maputo; 783,030 sq. km: **Pop:** 13693000; **Lang:** Portuguese, Bantu; **Rel:** Muslim and Christian; **Currency:** Metical (Plural Metical). US \$1=44.87 Metical.

Mozambique, formerly Portuguese East Africa, has for its neighbours Swaziland on the south, South Africa on the south and west, Zimbabwe, Zambia and Malawi on the west and Tanzania on the north. Mozambique Channel of the Indian Ocean bounds it in the east. The majority of the population belongs to the *Bantu* tribe.

The economy is based on agriculture. The major cash crops are cashewnuts, sugar, cotton, and sisal. Maize, bananas, rice and coconuts are also grown. Considerable mineral resources exist although only coal, diamonds and bauxite are now exploited. Mozambique has two-thirds of the world's known reserves of tantalite and is the second largest producer of beryl.

Persident: Samora Moises Machel.

NAMIBIA

Cap: Windhoek; **Area:** 824,292 sq. km; **Pop:** 1507000; **Lang:** English & Afrikans; **Rel:** Christian and Tribal; **Currency:** Rand.

Namibia, formerly known as South West Africa, lies on the Atlantic coast of Africa. The Atlantic Ocean flanks it on the west, Angola lies to the north, Zambia to the northeast, Botswana to the east, and South Africa to the south and southeast.

The biggest population group is the *Owambos*.

Diamonds are Namibia's most valuable economic asset followed by copper, zinc, lead, germanium and manganese. Stock-breeding is important; cattle, sheep and goats abound. Fishing is a supplementary source of food and income.

Former exile Moses Katji Ongua, once an avowed Maoist took over on December 24, 1985 as head of Namibia's six-month-old "transitional Government of national Unity".

The Government was installed by South African President Pieter Botha in June amid protests from around the world that it would hinder attempts at an internationally accepted settlement for Namibia.

Place of people

Namibia has not attained full freedom from South Africa. But SWAPO—South West Africa People's Organisation—which has been fighting for independence has been recognised by the UN and India has accorded diplomatic status to SWAPO.

Namib means place of no people, but Namibia is hardly that. It is the home of distinctive tribes—Owambos, and Hereros, Namas and San, Damaras and Kaven-gos, Caprivians and Tswanas—each with its own culture and history.

I found white tribes as well, descendants of German, Afrikaner and English settlers. These were people of mixed descent known as Coloureds—among them an aloof and vigorous community at Rehoboth who proudly call themselves Bas-tards.

It was a land that defied generalisations. "We speak 27 different languages and dialects in Namibia", an anthropologist told me in Windhoek"—Brian Hodgson in National Geographic.

NAURU

Cap: Nauru; **Area:** 20.9 sq.km; **Pop:** 8421; **Lang:** English and Nauruan; **Rel:** Christian; **Currency:** Dollar.

Nauru is a small island in the central Pacific. It is an oval-shaped coral island of approximately 12 miles in circumference, surrounded by a reef which is exposed at low tide. Nauru became an independent republic on Jan.31, 1968.

About four-fifths of the area of Nauru is phosphate-bearing rock. Phosphat form the only export.

President: Hammer de Roburt.

Mission in India: Consulate General of the Republic of Nauru, 15 Auranagzeb Road, New Delhi- 110 016.

NEPAL

Cap: Kathmandu; **Area:** 147,141 sq. km; **Pop:** 16107000; **Lang:** Nepali; **Rel:** Hindu and Buddhist; **Currency:** Rupee US\$1=19 Rupees.

Nepal is a kingdom in the southern slope of the Himalayas, situated between India and China.

Nepal is rich in forest wealth and quartz deposits. The principal exports are jute, rice, cattle, hides, wheat and herbal drugs.

King: Birendra Bir Bikram Shah Dev. **P.M:** Lokendro Bahadur Chand.

Mission in India: Embassy of Nepal, Barakhamba Road, New Delhi- 110 001.

NETHERLANDS

Cap: Amsterdam, Seat of Govt: The Hague; **Area:** 41,160 sq.km; **Pop:** 144456000; **Lang:** Dutch; **Rel:** Christian; **Currency:** Guilder. US\$1=3.88 Guilders.

The Kingdom of the Netherlands comprises the Netherlands and Antilles. The Netherlands is located in Europe, between Belgium and the Federal Republic of Germany. The country is plainland with an average height of 37 ft. above sea-level. Much of the land, however, is below sea-level and is protected by dykes, which extend for some 1500 miles.

Agriculture has been mechanised and developed. Foodstuffs form the largest industrial sector. Dairy products account for one-quarter of exports. Other major industries include chemicals, metallurgy, machinery and electrical goods. Amsterdam is famous as a world centre for diamonds, precious metals and art treasures.

Head of State: Queen Beatrix Wilhelmina Armgard.

Mission in India: Embassy of Netherlands, 6/50 F, Shantipath, Chanakyapuri, New Delhi- 110 021.

NEW ZEALAND

Cap: Wellington; **Area:** 269,057 sq.km; **Pop:** 3264000; **Lang:** English and Maori



dialect; **Rel:** Christian; **Currency:** Dollar US\$1=2.21 NZ\$.

New Zealand, lying in the South Pacific Ocean with Tasman Sea on the west, consists of two large islands, North island and South island and numerous small islands. It gained dominion status in 1907.

Primary industries are dairying, meat and wool. The major crops are wheat, oats and barley. Minerals include coal and gold. Pulp and paper industry is highly developed. Iron, steel and aluminium are new industries.

Head of State: Queen Elizabeth II, **Gov. Gen:** Sir David Beattie, **P.M:** David R. Lange.

Mission in India: High Commission of New Zealand, 39 Golf Links, New Delhi- 110 003.

NICARAGUA

Cap: Managua; **Area:** 130,000 sq.km; **Pop:** 3162000; **Lang:** Spanish, English; **Rel:** Christian; **Currency:** Cordoba. US\$1=10 Cordobas.

The republic of Nicaragua is located in the heart of Central America, bordered on the north by Honduras, on the south by Costa Rica, on the east by the Caribbean Sea and on the west by the Pacific Ocean. It became an independent state in 1838. The Somoza dynasty ruled Nicaragua from 1933 to 1979. The third Somoza was overthrown by armed revolution led by Sandinista National Liberation Front, which has emerged as the leading political force in the election held in 1984. But a Civil War is being waged against the present Ortega Govt. by former members of Nicaraguan National Guard (Somoastan), operating from Honduras with US support.

Agriculture is the principal source of national income. The most important agricultural products are cotton, coffee and sugar-cane. Chief industries are matches, leather, beer and plastic goods. Gold, copper, silver, lead and zinc are found.

President: Daniel Saavedra Ortega.

NIGER

Cap: Niamey; **Area:** 1,267,000 sq.km; **Pop:** 5940000; **Lang:** French and Hausa; **Rel:** Muslim and Tribal; **Currency:** Franc CFAO French F1=50 F CFA.

The Republic of the Niger lies in the heart

of West Africa. It is surrounded by Algeria and Libya in the north, Chad in the east, Nigeria and Benin in the south and Burkina Faso and Mali in the west.

Formerly part of French West Africa, Niger became fully independent in 1970.

It is an agricultural country with very limited resources. The principal crops are peanuts and cotton. Cattle-breeding is the next most important occupation of the people. Uranium has been discovered and mining is going on.

President: Maj. Gen. Seyni Kountche
P.M: Hamid Algabidi.

NIGERIA

Cap: Lagos (Federal); **Area:** 923,768 sq.km; **Pop:** 92037000; **Lang:** English, Hausa, Ibo and Yoruba; **Rel:** Muslim, Christian and Tribal; **Ex. R:** 0.56977 Naira=US \$1. **Currency:** Naira. US\$1=0.86 Naira.

The Federation of Nigeria is a West African coastal state within the Gulf of Guinea, with Niger to the north, Benin to the west and Cameroon to the east. River Niger flows through south Western Nigeria towards the south where it is joined by its chief tributary the Benue, and empties into the Gulf of Guinea, creating an extensive swampy delta.

Nigeria became an independent state in 1960 and a republic within the Commonwealth in Oct. 1963.

The chief agricultural products are cocoa, palm oil, palm kernels, cotton, rubber, peanuts and skins. Tin, lead, columbite, coal and iron ore represent the chief minerals. There is extensive exploitation of the forest for various timbers. Crude oil exports have become important since 1970. Industry is diversified, beer, cement, cigarettes and aluminium products being the main items.

Head of State and Govt: Maj. Gen. Ibrahim Babangida.

Mission in India: High Commission of Nigeria, 21 Palam Marg, Vasant Vihar, New Delhi- 110 057.

NORWAY

Cap: Oslo; **Area:** 323,895 sq.km; **Pop:** 4140000; **Lang:** Norwegian; **Rel:** Christian; **Currency:** Krone. US\$1=9.79 Kroner.

Norway extends along the western part of the Scandinavian Peninsula from the Skagerrak which separates it from Denmark to the North Cape in the Arctic Ocean, where it meets Finland and Soviet Russia.

Norway is known as the *Land of the Midnight Sun*, because in the North Cape area, the sun does not set from middle May until the end of July, nor does it rise above the horizon from the end of November to the end of January.

The important agricultural products are barley, oats, rye and potatoes. Fishing is a major occupation with immense quantities of cod, herring, whale, tuna, seal, mackerel and salmon. Forests provide raw material for many industries. Mining is an important industry. There is very little coal but plenty of hydro-electric power to run big factories. The principal manufactures are food products, machinery and metal work, wood, paper and pulp, aluminium and electro-chemical products.

Head of State: King Olav V. **P.M:** Karre Willoch.

Mission in India: Embassy of Norway, Kautilya Marg, Chanakyapuri, New Delhi-110 021.

Consulate: Bombay—Nauroji Mansion, 31 Nathelal Parekh Marg.

Calcutta: SF India Ltd, 6, Poonam Building, 5/2 Russel Street.

Madras: C/o International Services, 'Parry House', P.Box 396, 43 Moore St.

OMAN

Cap: Muscat; **Area:** 300,000 sq.km; **Pop:** 1181000; **Lang:** Arabic; **Rel:** Islam; **Currency:** Rial Omani (1000 Baiza). US\$1=346 Baiza.



The Sultanate of Oman, formerly Muscat & Oman, occupies the south eastern part of the Arabian Peninsula. Its coastline stretches along the Arabian Sea, the Gulf of Oman and the Persian Gulf. Oman adopted the present name in 1970.

Where there is water, the land is very fertile. The Batina coastal plain is famous for its dates, fruits and grains. Oil, however, is the ace of the economy.

Head of State & Govt: Sultan Oabus bin Said.

Mission in India: Embassy of Oman, 16, Palam Marg, Vasant Vihar, New Delhi-110 057.

PAKISTAN

Cap: Islamabad; **Area:** 796,095 sq. km; **Pop:** 98971000; **Lang:** Urdu; **Rel:** Islam; **Currency:** Rupee, US\$1=16.03 Rupees.

The Islamic Republic of Pakistan, now confined to West Pakistan, originally came into existence in 1947, following the partition of India into two states, India and Pakistan. Its eastern wing, formerly called East Pakistan, fell apart in 1971. Pakistan is bordered by Afghanistan, Iran, India and China.

Agriculture is the mainstay of Pakistani economy. Wheat, sugarcane, cotton and rice are the major crops. Industries are being developed with indigenous resources and foreign knowhow and assistance. A wide range of minerals like graphite and limestone remain to be exploited.

President: Gen. Mohammed Zia-Ul-Haq; **PM:** Mohammed Khan Junejo.

Mission in India: Embassy of Pakistan, 2/50-G, Shantipath, Chanakyapuri, New Delhi-110 021.

PANAMA

Cap: Panama City; **Area:** 77,082 sq. km; **Pop:** 2134000; **Lang:** Spanish; **Rel:** Christian; **Currency:** Balboa, US\$1=1Balboa.

Panama is a narrow strip of territory at the southern end of the Isthmus separating North and South America. It is situated between Costa Rica and Colombia. The Caribbean Sea is on the north and the Pacific Ocean in the south. And its narrowest point, 50 miles wide, the Atlantic and the Pacific Oceans are united by the famous Panama Canal. It declared itself independent in 1903.

Control over the Panama Canal, linking the Atlantic and Pacific Oceans, had long been a bone of contention between the US and Panama. In 1978, it was agreed that the US will relinquish all its claims in favour of Panama at the close of the century.

The soil is extremely fertile but nearly one-half of the land is uncultivated. The chief crops are bananas, coffee and cereals. Industry is mainly centred around sugar and alcoholic beverages. Shrimp fishing is important. There are excellent timber resources, notably mahogany.

President: Eric Arturo Delvalle.

Mission in India: Embassy of Panama, S-260, Greater Kailash, New Delhi.

Consulate: Bombay-402-412 Himalaya House, Dr. D.N. Road.

PAPUA NEW GUINEA

Cap: Port Moresby; **Area:** 462,840 sq. km; **Pop:** 3601000; **Lang:** Melanesian and Papuan; **Rel:** Christian and Tribal; **Currency:** Kina. US\$1=K 1.04.

Papua New Guinea comprises the eastern section of the island of New Guinea and adjacent islands.

It is a region of lofty mountains and swampy plains. The surrounding islands are largely of volcanic or coral origin.

The population consists of dark-skinned Melanesians, who live mostly along the coasts and woolly-haired Papuans who inhabit the interior.

Agriculture occupies the majority of the population, most of whom are subsistence farmers. Sago, yams, taro, manioc, and sweet potatoes are the main food crops. Cash crops include coconuts, cocoa, coffee and rubber. The country has large deposits of various minerals. Gold and copper are being mined. Oil and natural gas have also been found.

Gov. Gen: Sir Kingford Dibela; **PM:** Palas Wingti.

PARAGUAY

Cap: Asuncion; **Area:** 406,752 sq. km; **Pop:** 3,576,000; **Lang:** Spanish, Guarani; **Rel:** Christian; **Currency:** Guarani, US\$1=240 Guaranes.

Paraguay is one of the landlocked countries of South America surrounded by Bolivia, Brazil and Argentina. The Paraguay river is navigable for some 1800 miles and steamers

come upto Asuncion which is the chief port of the state. This makes up for lack of coastline or sea harbours. It became independent in 1811.

About 75 per cent of the population is engaged in agriculture and allied pursuits with cattle breeding as an important occupation. The most important agricultural crops are corn, cotton, beans, tobacco and citrus fruits. The timber resources of the state are enormous. The chief exports are beef and other food products, quebracho (hard wood), hides and skins.

President: Alfredo Stroessner.

PERU

Cap: Lima; **Area:** 1,281,215 sq. km; **Pop:** 19,197,000; **Lang:** Spanish and Quechua; **Rel:** Christian; **Currency:** Sol. US\$1=7521 Sol.

Peru, on the Pacific coast of S. America, has for its neighbours, Ecuador and Colombia in the north, Brazil and Bolivia in the east and Chile in the south. The Andes mountains dominate Peru. Some of the rarest species of animals, the vicuna, the llama, the alpaca and the cross-breed paco-vicuna are found in the Andean mountains, where they are now protected.

Peru was originally the seat of the famous Inca (Red Indian) Empire. It became independent in 1824.

The leading agricultural products are cotton, wool, sugar, coffee, rice and potatoes. Corn which is native to Peru is the staple food of the Indians, who also cultivate alfalfa. Fishing industry is well developed and Peru is the world's most important producer of fishmeal. The country is rich in minerals and some mines dating back to the Incas are even now worked. Peru is one of the leading producers of silver. Some of the biggest copper mines in the world are located in Peru. The chief exports are cotton, fish products, petroleum, sugar and iron ore.

President: Alan Garcia Perez Fernando Belaunde Terry; **PM:** Luis Pardoval, Rosa

Mission in India: Embassy of Peru, 1120 Shantiniketan, New Delhi-110 021.

Consulate: Bombay-'Mount Nepean', 37 C. Lady Laxmibai, Jagmohandas Marg.

PHILIPPINES

Cap: Manila; **Area:** 3,00,000 sq. km; **Pop:** 5,33,95,000; **Lang:** Filipino and English.

Religion: Christian and Muslim. **Currency:** Peso. 1:1 = 100 Pesos.

The Philippines lies 600 miles off the west coast of Asia, 15 degrees above the equator. To its north lies Taiwan, to the south Borneo, to the east the Pacific Ocean, and to the west the China Sea.

An archipelago, the Philippines is composed of 7,107 islands, which include the island groups of Luzon, the Visayas, and Mindanao.

The country's industries include rubber, tobacco, oil refining, fruit canning, flour, long paper, cell organs and cigarettes, meat, fertilizers, plywood and lumber, oil and glassware, furniture and textiles, chemical and pharmaceutical goods, food products and beverages.

Major agricultural crops are rice, maize, sugarcane, tobacco, abaca, pineapple, coconut, banana, mangoes and others.

The Philippines is rich in natural resources. It has iron, silver, gold, chromite, manganese and copper deposits in commercial quantity. It has also marble quarries, forests and extensive fishing grounds in its territorial waters.

Philippines became an independent republic on June 12, 1898.

President: Ferdinand E. Marcos. **P.M.:** Imelda R. Marcos.

Mission in India: Embassy of Philippines, 14, Nyaya Marg, Chanakya Park, New Delhi-110 021.

Consulate: Bombay—Industry House, 159, Link Road, Fort.

Calcutta: Mercantile Buildings (2nd Floor), 10, B-10, Lal Bazar Street.

Madras: 97, Mount Road.

POLAND

Cap: Warsaw. **Area:** 312,677 sq km. **Pop:** 38,000,000. **Lang:** Polish. **Rel:** Christian. **Currency:** Zloty. US \$1 = 141 Zlotys.

People's Republic of Upper Central Europe. Poland is bordered by the Baltic USSR, Czechoslovakia and the German Democratic Republic.

Poland whose history goes back to the 10th century A.D. became independent in 1918.

Forty-two per cent of the population is engaged in agriculture. Chief crops are rye, wheat, potatoes, sugar beets, tobacco



and flax. The country has vast resources of mineral wealth, particularly coal, besides iron, lignite, natural gas, lead and zinc. Textiles, chemicals and metallurgy are old established industries. New industries include automobiles, tractors, heavy machinery, ship building and aircraft. Main exports are wheat, coal, steel and clothing.

Chairman of State Council: Włodzisław Jastrzębski. **P.M.:** Zbigniew Messner.

Mission in India: Embassy of Poland, 50 M, Chanakya Park, Chanakya Park, New Delhi-110 021.

Consulate: Bombay—Marani Apartments, 38 B-10, Kher Marg.

Calcutta: 3-B, Albert Road.

PORTUGAL

Cap: Lisbon. **Area:** 92,072 sq km. **Pop:** 1,00,00,000. **Lang:** Portuguese. **Rel:** Christian. **Currency:** Escudo. US \$1 = 180 Escudos.

Portugal is a small rectangular territory in the southwest corner of the Iberian Peninsula. It is bounded on the north and east by Spain and the south and west by the Atlantic Ocean.

Portugal was an independent kingdom from the 12th century. It became a republic in 1910.

Nineteen per cent of the country is forest where pine, oak, chestnut and cork grow in abundance. Vineyards are found everywhere and wines, olive oil and fruits are produced in large quantities. The major minerals are coal, copper, kaolin, wolframite, lithium and titanium. Textiles, chemicals, paper and glassware are the principal manufactures. The main exports are wine, canned sardines, tuna, anchovies, resins and cork. Portugal is one of the leading countries in the world which produce cork.

President: Gen. Américo Tomás.

P.M.: Antonio Cavaco Silva.

Mission in India: Embassy of Portugal, A-24 West End Colony, New Delhi-110 021.

Consulate: Calcutta—Bakulia House, Kidderpore.

PUERTO RICO

Cap: San Juan; **Area:** 8891 sq.km; **Pop:** 34,04,000; **Lang:** Spanish and English; **Rel:** Christian; **Currency:** Dollar.

The island of Puerto Rico lies 50 miles east of Hispaniola (Haiti and Dominican Republics) in the outer Caribbean. In 1952, it ceased to be a colonial possession and became a Free Commonwealth. It has close association with U.S. People have U.S. citizenship with no voting rights. There is a movement for full independence.

From a purely agricultural country, Puerto Rico is fast changing to an industrial economy. The main crops are sugar, tobacco and coffee. Industries include textiles, clothing, cigars, alcohol, chemicals and household appliances. Tourism is an important source or revenue.

QATAR

Cap: Doha; **Area:** 11,000 sq.km. **Pop:** 2,91,000; **Lang:** Arabic; **Rel:** Islam; **Currency:** Riyal. US\$1=3.64 Riyals.

Qatar is a 100-mile-long tongue of land jutting into the Persian (Arabian) Gulf. It is surrounded almost on three sides by the Persian Gulf. Saudi Arabia lies to the south.

It became independent in 1971 when Britain withdrew from the Persian Gulf. Qatar is an absolute monarchy.

Most of the population live in and around Doha, the capital. Immigrants from Pakistan, Iran and Oman now outnumber the native Qataris. Today the oil industry provides over 90% of the national income but employs only less than 5% of the population. Qatar is now connected by road to the rest of Arabia and by air to the rest of the world.

Amir: Shaikh Khalifah bin Hamad al Thani.

P.M.: Heir Apparent Shaik, Khalifah bin Hamad al Thani.

Mission in India: Embassy of Qatar, A-3 West End Colony, New Delhi-110 021.

Consulate: Bombay—Bajaj Bhavan, Nariman Point.

ROMANIA

Cap: Bucharest; **Area:** 2,37,500 sq.km; **Pop:** 2,28,97,000; **Lang:** Romanian; **Rel:** Christian;

Currency: Leu US\$1=11 Lei.

Romania, lying in the South East of the Central part of Europe, borders on USSR to the north and east, on Hungary to the west, on Yugoslavia to the south west and on Bulgaria to the south.

The Black Sea shore has a length of 245 km. Modern Romania was formed in 1859. Industry now dominates Romania's economy. Romania became an industrial-agrarian country.

Heavy industries predominate drilling rigs for oil, equipments for oil refineries, petrochemical industry, cement, thermo and hydro electric power, diesel and electric locomotives of high capacity, engineering and consumer goods, etc.

Romanian agriculture recorded profound changes during the last three decades. The changes began with the land reforms of 1945. The small and middle-sized peasant properties were converted into co-operatives, a process which started in 1949 and ended in 1962. Land, which is the common property of the co-operative farmers, is tilled in common.

The exports are mostly made up of machines and equipment, chemical products, chemicals, fertilizers and industrial consumer goods.

President: Nicolae Ceausescu. **P.M.:** Constantin Dascalescu.

Mission in India: Embassy of Romania 52/A Vasant Marg, New Delhi-110 057.

RWANDA

Cap: Kigali; **Area:** 26,338 sq.km; **Pop:** 59,03,000; **Lang:** French and Kinyarwanda; **Rel:** Tribal and Muslim; **Currency:** Rwanda Franc. US\$1=108.18 RF.

Rwanda is a republic in Central Eastern Africa, just below the equator. It is bordered by Zaire, Uganda, Tanzania and Burundi. The population of Rwanda includes Watutsi, Bahutu and Batwa tribes.

The Republic of Rwanda, formerly part of the Belgian Trusteeship of Ruanda-Urundi in east central Africa, became independent in 1962.

The economy is agricultural and remains mainly at the subsistence level. Coffee, cotton and pyrethrum are the principal crops. Minerals include tin ore, tungsten, tantalite, and beryl. Industry is undeveloped. Livestock raising is wide-spread and hides and skins are exported.

President: Maj-Gen Juvenal Habyarimana.

SAN MARINO

Cap: San Marino; **Area:** 61 sq.km; **Pop:** 21622; **Lang:** Italian; **Rel:** Christian; **Currency:** Lira.

The republic of San Marino is situated on the slope of Mount Titano in the Apennines on the Adriatic side in the heart of Italy.

It claims to be the oldest state in Europe, having been founded in A.D. 301.

The principal products are wheat, wine and olives. Industries include textiles, ceramics, cement, paper, leather and woollen goods. Tourism is the major source of revenue.

Captains-Regent: Marino Benedetto Beluzzi IV & Giuseppe Micheloni II.

Mission in India: Consulate Central of San Marino, 15, Aurangzeb Road, New Delhi-110 011.

SÃO TOME & PRÍNCIPE

Cap: Sao Tome; **Area:** 964 sq.km; **Pop:** 202000; **Lang:** Portuguese, native dialects; **Rel:** Christian; **Currency:** Dobra. US\$1=46.66 Dobra.

These two islands, with a few other nearby islets, lie in the Gulf of Guinea, about 125 miles from Gabon. Situated north of the equator, these islands have hot steaming weather in the summer, but plenty of rainfall. The largest of the islands is Sao Tome, on which stands *Sao Tome*, the capital and chief port.

These islands were under the Portuguese until 1975 when they became independent.

Today, the country's economy is geared almost exclusively to the production of agricultural export commodities, especially cocoa. Sao Tome has to import most of its food. There is virtually no manufacturing industry except soap, soft drinks, etc.

President and PM: Manuel Pinto da Costa.

SAUDI ARABIA

Cap: Riyadh (Royal) and Jeddah (Administrative); **Area:** 2,149,690 sq.km; **Pop:** 20,824,000; **Lang:** Arabic; **Rel:** Islam; **Currency:** Rial. US\$1=3.60 Rials.



Saudi Arabia occupies nearly four-fifths of the Arabian peninsula with the Yemen Arab Republic and the Red Sea on the west and the Gulf and the UAE on the east. Jordan and Iraq lie in the north and Kuwait in the north east. Oman and the P.D.R. Yemen are in the south.

In the Province of Hejaz are Medina, where Mohammed the Prophet was buried on June 7, 632 and Makkah the birthplace of the Prophet. There is a great mosque in Makkah which shelters the sacred shrine, the Kaaba. On one side of the Kaaba is the black stone believed to have been given to Abraham by Archangel Gabriel. This shrine is the place of pilgrimage for Muslims the world over.

Saudi Arabia is an absolute monarchy, with no parliament.

Saudi Arabia has great oil wealth and is the foremost exporter of petroleum products today. The income from oil forms the major source of public revenue. All the same, Saudi Arabia remains an agricultural country whose main products are dates, wheat, barley, fruit, hides and wool.

Head of State & Govt: King Fahd Ibn Abdel Aziz al Said.

Mission in India: Embassy of Saudi Arabia, 1, Mahatma Gandhi Marg, Kilokri, New Delhi-110 014.

Consulate: Bombay—Jolly Chamber No 11, 12th Floor, Nanman Point.

SENEGAL

Cap: Dakar; **Area:** 196,162 sq.km; **Pop:** 6352000; **Lang:** French and native tongues; **Rel:** Muslim and Tribal; **Currency:** Franc CFA. French F1=50 FCFA.

Senegal lies on the West African bulge. It is bounded on the north by Mauritania, on the east by Mali and on the south by Guinea and Guinea-Bissau. In the southern part of the country, Gambia forms a narrow enclave extending some 200 miles into the interior.

Formerly a French colony, Senegal became a self-governing republic in 1960.

Agriculture and livestock are the chief occupations. There are important deposits of iron ore and phosphate. Developing industries include food processing, chemicals and textiles.

President: Abdou Diouf.

SEYCHELLES

Cap: Victoria; **Area:** 308 sq.km; **Pop:** 64718; **Lang:** Creole and French; **Rel:** Christian; **Currency:** Rupee. US\$1=7.62 Rupees.

Seychelles forms a group of lovely islands, in western Indian Ocean. The principal island is Mahe on which the capital Victoria is situated. The group consists of some 92 islands, of which 45 are coralline and the rest granitic. Seychelles became an independent republic in 1976.

Seychelles was entirely uninhabited when the French established settlements there in 1770.

The population of Seychelles is of mixed origin, a unique blend of European, African, Indian and Chinese races. The Seychelles have evolved a mixed language, which may be called Creole. Coconuts take the pride of place among agricultural products. Cinnamon is the next major crop and export. Other crops like tea and lime are also grown. Fishing is another major occupation. Tuna, mullet, mackerel, sardines and shell fish abound in the offshore waters.

President: France Albert Rene.

SIERRA LEONE

Cap: Freetown; **Area:** 71.740 sq.km; **Pop:** 3536000; **Lang:** English and Tribal; **Rel:** Tribal; **Currency:** Leone. US\$1=6 Leone.

Sierra Leone (meaning mountain of the lion) was the name originally given to this area by Portuguese sailors mainly on account of the thunder-storms around its coastal peaks. It lies on the West African bulge,

between Guinea and Liberia.

Formerly under British rule, Sierra Leone became independent in 1961.

The economy is based on agriculture and mining. Principal products are industrial diamonds, iron ore, bauxite, kola nuts, palm kernel, cocoa and coffee.

President: Maj. Gen. Joseph Saidu Momoh.

SINGAPORE

Cap: Singapore city; **Area:** 616.3 sq.km; **Pop:** 2540000; **Lang:** Malay and Chinese; **Rel:** Buddhist and Muslim; **Currency:** Dollar. US\$1=2.28 Dollars.

Singapore is a small island with some 54 outlying islets situated at the southern tip of the Malay Peninsula, to which it is linked by a causeway. The island is about 41.84 km in length and 22.53 km in breadth.

The population of Singapore is composite. The Chinese comprise 76.1% and Malays 15.1%.

In August 1965 Singapore became an independent Republic.

The country is an entrepot for Malaysia and other southeast Asian states. The chief exports are rubber and tin. Industries include tin smelting, rubber goods, lumber working and ship-building, textiles and electronics.

President: Wee Kim Wee, **P.M.:** Lee Kuan Yew.

Mission in India: High Commission of Singapore, B-70, Greater Kailash 1, New Delhi- 110 048.

SOLOMON ISLANDS

Cap: Honiara; **Area:** 29.758 sq.km; **Pop:** 258193; **Lang:** English and Pidgin; **Rel:** Christian; **Currency:** Solomon island Dollar (S1\$). US\$1=1.44 S1\$.

The Solomon Islands are in the South West Pacific and lie to the east of Papua Guinea. Originally a British Protectorate, it achieved independence in 1978.

The population is predominantly Melanesian. Copra is the main cash crop and rice the chief food crop. Fish is a vital element in food and an export item.

Gov. Gen: Sir Baddeley Devisi. **P.M.:** Peter Kenilorea.

SOMALIA

Cap: Mogadishu; **Area:** 637,657 sq.km; **Pop:** 5423000; **Lang:** Somali and English; **Rel:** Islam; **Currency:** Somali Shilling. US\$1=36.60 Som. Shilling.

A republic on the east coast of Africa, Somali Republic is bounded by the Gulf of Aden on the north, the Indian Ocean on the east, Kenya, Ethiopia and Djibouti on the west.

The Somali Republic was formed by the union of the former Italian Somaliland and the British Somaliland on July 1, 1960.

Somalia is an undeveloped agricultural country. Seventy per cent of the population is nomadic, moving about with their flocks of sheep, goats and camels. Settled agriculture is now being developed along the river valleys.

President: Maj. Gen. Mohammed Ziyad Barre.

Mission in India: Embassy of Somalia, 12-A, Golf Links, New Delhi- 110 003.

SOUTH AFRICA

Cap: Cape Town; **Area:** 1,221,037 sq.km; **Pop:** 31586000; **Lang:** Afrikaans and English; **Rel:** Christian; **Currency:** Rand. US\$1=2.06.

The Republic of South Africa lies at the southern tip of the continent of Africa. Namibia and Botswana lie in the north and Mozambique in the NE, and Swaziland in the east. S. Africa includes the original white colonies of the Cape of Good Hope, Natal, Transvaal and Orange Free State. Formerly known as the Union of South Africa, it became a republic after leaving the Commonwealth in March 1960.

The major agricultural products are cotton, wheat, tobacco, sugarcane and citrus fruits. With vast mineral resources, South Africa is the biggest gold and diamond producing country in the world and one of the biggest in uranium. About 47 per cent of the world's total production of gold is from South Africa. Other minerals include coal, copper, tin, manganese, iron, lead and chrome. Manufacturing industries include heavy engineering, chemicals, textiles and food processing.

The country follows a policy of *Apartheid*, the separate development of racial groups. Under the Bantu Home lands constitution Act of 1971, self-government has been given to Transkei, Bophuthatswana, Venda and Ciskei.

No country in the world has recognised these states as independent entities. Nevertheless the show goes on.

President: Marais Viljoen. **P.M.:** Pieter Wilhelm Botha.

SPAIN

Cap: Madrid; **Area:** 5,04,750 sq.km. **Pop:** 3,87,17,000; **Lang:** Spanish; **Rel:** Christian; **Currency:** Peseta. US\$1=190 Pesetas.

Spain is bounded on the north by France and the Bay of Biscay and on the west by Portugal. To the east is the Mediterranean.

With the discovery of America for Spain by Columbus in 1492, Spain became a great colonial empire. After the defeat of the Spanish Armada by England in 1588, Spain shrunk into a minor continental power. In 1939, it passed under the dictatorship of Gen. Franco. On Franco's death in 1975 Spain became a constitutional monarchy.

Traditionally an agricultural country, Spain's main products are cereals, vegetables and fruits. Industries include chemicals, machine tools and ship-building.

Head of State: King Juan Carlos. **P.M.:** Felipe Marquez Gonzales.

Mission in India: Embassy of Spain, 12 Prithviraj Road, New Delhi-110 011.

Consulate: Bombay- 6, K-Dubash Marg. Calcutta: No.1, Taratolla Road, Garden Reach.

Madras: Lawdale' 8, Nimmo Road, San Thome.



SRI LANKA

Cap: Colombo; **Area:** 65,610 sq.km.; **Pop:** 1,60,76,000; **Lang:** Sinhala and Tamil; **Rel:** Buddhist and Hindu; **Currency:** Rupee. US\$1=26.72.

Sri Lanka, is an island, separated from India by the shallow Palk Strait. It is bounded on the west by the Palk Strait and the Gulf of Mannar, on the north and east by the Bay of Bengal and on the south by the Indian Ocean.

Sri Lanka became independent in 1948 as a member of the Commonwealth. 1985 saw bloody confrontation between northern Tamilians seeking at separate province and the government.

Sri Lanka's major products are agricultural—tea, rubber and coconuts. The commercially important mineral is graphite. There are deposits of iron ore, monazite, ilmenite, limestone, clay and kaolin. Industries include cement, textiles and fertilizers. Sri Lanka embarked on a programme of economic reconstruction in which the harnessing of the Mahawali river for irrigation and hydel power, a housing construction programme, an Investment Promotion zone, etc. are important features.

President: J.R. Jayawardene. **P.M.:** Rana-singhe Premadasa.

Mission in India: High Commission of Sri Lanka, 27 Kautilya Marg, Chanakyapuri, New Delhi-110 021.

Consulate: *Bombay*— Sri Lanka Home, 34 Homi Modi Street.

Madras: 9-D Nawab Habibullah Ave, Anderson Road.

ST. KITTS-NEVIS

Cap: Basseterre; **Area:** 269 sq.km.; **Pop:** 44,109; **Lang:** English and Patois; **Rel:** Christian; **Currency:** Dollar.

St. Christopher (Kitts)-Nevis is two islands in East Caribbean separated by a narrow channel 2 miles wide. The islands were given the status of an Associate State with Britain in 1967 and became independent on Sept. 18, 1983. At that time Anguilla was part of St. Kitts-Nevis. The Anguillians revolted against this arrangement and Anguilla was separated. (see *Dependencies infra*)

The population is mostly black. The economy is agricultural, sea island cotton and sugar cane being the principal crops.

Gov. Gen: Sir Clement Athelston Arrindell. **P.M.:** Dr. Kennedy Alphonse Simmonds.

ST. LUCIA

Cap: Castries; **Area:** 616 sq.km.; **Pop:** 1,26,800; **Lang:** English and French patois; **Rel:** Christian; **Currency:** Dollar.

St. Lucia, the second largest island in the Windward group, lies to the south of Martinique and to the north of St. Vincent. It became independent on Feb. 22, 1979.

The economy is agricultural, copra, coconut oil, bananas and cocoa being the main export items. Manufactures include plastics, garments and beer.

Gov. Gen.: Sir Allen Lewis. **P.M.:** John George Melvin Compton.

ST. VINCENT

Cap: Kingstown; **Area:** 389 sq.km.; **Pop:** 1,23,000; **Lang:** English and French Patois; **Rel:** Christian; **Currency:** Dollar.

One of the Windward Islands, west of Barbados, St. Vincent became a British Associate State in 1969 and achieved independence on Oct. 27, 1979.

The population is of mixed origin—European-Negro and Carib-Indian. Bananas, arrowroot, copra, sea island cotton and spices are the main exports. Tourism is important.

Gov. Gen.: Sir Sydney Gun-Murro. **P.M.:** James Fitz Allen Mitchell.

SUDAN

Cap: Khartoum; **Area:** 25,05,813 sq.km.; **Pop:** 2,09,45,000; **Lang:** Arabic and English; **Rel:** Muslim, Christian and Tribal; **Currency:** Pound. US\$1=£S2.50.

A republic of north east Africa, Sudan is bounded by Egypt on the north, the Red Sea and Ethiopia on the east, Kenya in the south east and Uganda and Zaire on the south. Central African Republic and Chad lie to the west. The White Nile flows through the middle of the country and joins the Blue Nile at Khartoum. The Sudanese population consists of Arabs, Negroes and Nubians of mixed Arab and Negro blood. Sudan became an independent state in 1885.

The main agricultural crop sorghum is the

country's staple food. Other products include longstaple cotton, sesame, peanuts, dates, hides and skins, chillies, beans and corn. Sudan is the world's principal source of gum Arabic. Rice, peanuts, coffee, sugar cane and tobacco are expanding items of agricultural production. Sudan's mineral wealth includes copper, gold, iron, manganese and magnesite.

Oil was struck recently in the Sudan.

President: Abdul Rahman Mohammed Hassan Swaredahab.

Mission in India: Embassy of Sudan, M14, South Extension 11, New Delhi-110 049.

SURINAME

Cap: Paramaribo; **Area:** 1,63,265 sq.km; **Pop:** 3,52,000; **Lang:** Dutch and English; **Rel:** Muslim and Christian; **Currency:** Guilder US\$1=1.78 Guilders.

Suriname, formerly Dutch Guiana, lies on the north east coast of South America. It shares its frontiers with French Guiana in the east, Brazil in the south and the Republic of Guyana in the west. The Atlantic Ocean (Caribbean Sea) bounds, it on the north. It became independent in 1975.

The population comprises a medley of ethnic strains—Negroes, Chinese, East Indians and Indonesians. Mulattoes (of mixed European and East Indian parentage), Amerindians and Europeans form 40 per cent of the population.

Much of the land is given to rice cultivation. The country is rich in minerals. It is the second biggest producer of bauxite in the world. Bauxite, alumina and aluminium constitute nearly 90 per cent of the exports.

Chairman, National Military Council: Lt. Col. Deysi Bouterse. **P.M.:** Henk Chin A Sen.

SWAZILAND

Cap: Mbabane; **Area:** 17,363 sq km; **Pop:** 6,30,000 **Lang:** English and si-Swati, **Rel:** Christian and Tribal. **Currency:** Emalangeui. US\$1 = 2.06 Emalangeui.

Swaziland is surrounded almost entirely by South Africa. Mozambique to the east is its only other neighbour.

Swaziland, formerly a British protectorate, attained independence on Sept. 6, 1968.

Sugar is the principal item in the economy.

with citrus fruits, cotton, rice and maize, coming next. But the main wealth of the Swazis is cattle. There are considerable mineral reserves, especially, asbestos, iron and coal.

Head of State: Regent: Queen Ntombi. **P.M.:** Prince Bhekimpi Dlamini.

SWEDEN

Cap: Stockholm; **Area:** 4,49,793 sq.km.; **Pop:** 82,84,000; **Lang:** Swedish; **Rel:** Christian; **Currency:** Krona. US\$1=9.69 Krona.

Sweden is the largest of the Nordic countries and in terms of area, the fourth largest country in Europe. To the west, the Scandinavian mountain range divides Sweden from Norway. To the northeast, a shorter range separates Sweden from Finland. Otherwise, Sweden is surrounded by water—Baltic Sea and the North Sea. Sweden has been a constitutional monarchy since 1434.

Sweden has rich natural supplies of coniferous forest, water power, iron ore, uranium and other minerals but lacks significant oil and coal deposits.

The country is highly industrialised. Today about 40 per cent of the country's industrial production is exported. Swedish steel is especially reputed for tool making. Sweden is one of the greatest producers of wood pulp paper and lumber.

Head of State: King Carl XVI Gustav. **P.M.:** Olaf Palme.

Mission in India: Embassy of Sweden, Nyaya Marg, Chanakyapuri, New Delhi-110 021.

Consulate: Bombay—Indian Mercantile Chambers, Nicol Road, Ballard Estate.

Calcutta: 6, Poonam Building, 5/2 Russel Street.



Madras: 41, Fort Main Road, Raja Annamalaiapuram.

SWITZERLAND

Cap: Berne; **Area:** 41,293 sq.km.; **Pop:** 63,09,000; **Lang:** German, French, Italian and Romansch; **Rel:** Christian; **Currency:** Franc. US \$1=2.93 Francs.

Switzerland, a Confederation in Central Europe, is bounded by France, Germany, Austria, and Italy. It is a mountainous country, with the Alpine ranges rising from its bosom. The country is famous for its lakes.

Since 1291 Switzerland has remained a completely independent country. It is a multi-lingual state with most people talking more than one language.

The Swiss terrain offers little scope for farming. Nevertheless, a number of small efficient farms operate and keep the farming community going. The emphasis is on livestock and dairying. Forests help by providing plenty of wood. From the earliest times Switzerland had been famous for its cottage industries—high quality products but no large-scale production.

World's Richest Nation

Switzerland is the richest nation in the industrialized world, an analysis by the Society for Development of the Swiss Economy (SDSE) shows.

According to the analysis, Switzerland's per-capita gross national product in 1983 was 30,300 Swiss francs (nearly 13,340 US dollars).

Switzerland is followed by Norway (27,000 francs), the United States (26,600), Canada (24,600), Sweden (24,200), Denmark (22,400), and the Federal Republic of Germany (21,700).

France, with a per-capita GNP of 20,200 Swiss francs is just above the average of 18,400 francs for the Organization for Economic Co-operation and Development (OECD) countries, Japan (18,200), Austria (18,000), Belgium (17,400) and the Great Britain (17,300) are below this average.

Swiss-made watches and clocks used to be famous the world over. Precision tools and machines form another specialised industry. The availability of electric power in every cottage has fostered growth of all kinds of small industries throughout Switzerland. Tourism is the third most paying industry. India has always been one of the major recipients of Swiss assistance, specially in the areas of cattle breeding, rural development, vocational training and in various fields of applied research.

President of the Confederation for 1986: Alphons Egli.

Mission in India: Embassy of Switzerland, Nyaya Marg, Chanakyapuri, New Delhi-110 021.

Consulate: Bombay- Menek Mahal, 7th Floor, 90 Vir Nariman Road.

SYRIA

Cap: Damasucs; **Area:** 1,85,180; sq.km.; **Pop:** 1,01,89,000; **Lang:** Arabic; **Rel:** Islam; **Currency:** Pound. US \$1=£Syr 3.92.

The Syrian Arab Republic in the middle east lies in between Turkey, Iraq, Jordan, Israel and Lebanon. The Mediterranean Sea is on the west. The Orontes and Euphrates rivers pass through Syria. The chief seaport is Latakia.

Syria, the seat of an ancient civilization became a fully independent sovereign republic in 1944.

Agriculture and cattle-breeding comprise the major occupations of the people. The chief crops are cotton, wheat, tobacco and olives. The only mineral found is oil. Industries include oils, soap, textiles, leather and tobacco.

President: Lt. Gen. Hafez al-Assad. **P.M.:** Abdel Raouf al-Kasm.

Mission in India: Embassy of Syrian Arab Republic, 28 Vasant Marg, Vasant Vihar, New Delhi-110 057.

Consulate: Bombay- 3rd Floor, Cambatta Building, Sir Jamshedji Tata Road.

TAIWAN

Cap: Taipei; **Area:** 35,981 sq.km.; **Pop:** 1,88,00,000; **Lang:** Mandarin Chinese; **Rel:** Buddhist and Confucian; **Currency:** New Taiwan Dollar. US \$1=NT \$39.28.

Taiwan, formerly known as Formosa, in-

Swiss Shun UN

Public opinion polls in Switzerland in late 1985 indicated that a majority of Switzerland's citizens opposed membership in the United Nations primarily because of fears that the country's much-prized neutrality could be compromised. At the same time, the Government is facing the rise of a rightist political party called Vigilance, which scored victories in the French-speaking cities of Geneva and Lausanne on a platform that included opposition to joining the U.N.

But Swiss Government officials have started a campaign of public appearances, meeting and speeches to persuade voters to approve Swiss membership of the U.N. in a national referendum scheduled for March 16, 1986. the campaign follows approval by the Upper House of Parliament in 1984 of Swiss membership in the world organisation. That paved the way for a national vote.

The campaign will be difficult—"for the circumstances are not in our favour", said Mr. Guy Olivier Segond, president of the Geneva Association for the United Nations.

Officials of Mr. Segond's organisation note that Switzerland's neutral foreign policy has remained intact despite its membership in the WHO and UNESCO. The Foreign Minister, Mr. Pierre Aubert, in a recent speech in Geneva marking the 40th anniversary of the U.N. said: "We are already profoundly engaged in the U.N. system, and no one in Switzerland—even those who oppose our entry into the U.N.—can call that engagement into question."

cludes not only Taiwan proper, but also a number of small islands.

Originally Taiwan, and adjoining areas were Chinese territory. In 1950 Chiang Kai Shek made Taiwan the headquarters of the Nationalist Republic of China. Although Taiwan still claims to be the legal government of all China it lost its membership in the UN and its permanent seat in the Security

Council to Communist China in 1971.

The main agricultural products are rice, tea, sugar, sweet potatoes, ramie, jute and turmeric. Camphor secured from forests is a governmental monopoly. Industries comprise cotton fabrics and electrical goods, iron works, glass and soap. Coal, marble, petroleum and natural gas are the principal minerals.

President: Chiang Ching-Ku; **P.M.:** Yu Kuo-hua.

TANZANIA

Cap: Dar-es-Salam; **Area:** 9,45,087 sq.km.; **Pop:** 2,17,10,000; **Lang:** Kiswahili and English; **Rel:** Christian and Muslim; **Currency:** Shilling US\$1=Sh.18.50.

Tanzania consists of Tanganyika and the islands of Zanzibar and Pemba. Tanganyika is situated in East Africa and lies in between Uganda, Kenya, Mozambique, Malawi and Zambia. Zaire is on the west and the Indian Ocean is on the east. The islands of Zanzibar, Pemba, Lamu, Menda, Patta and Siu are about 40 km off the coast north of Dar-es-Salam.

In April 1964, the People's Republic of Zanzibar and Pemba and the Republic of Tanganyika merged to form the United Republic of Tanzania.

The economy is agricultural. The chief cash crops are sisal, sugar, cotton and coffee. Cloves are grown on the islands, chiefly on Pemba. Livestock is extensively raised. Diamonds are an important export. Other minerals include gold, tin and salt.

Head of State: Ali Hassan Mwinyi. **P.M.:** Salim Ahmed.

Mission in India: High Commission of Tanzania, 27 Golf Links, New Delhi-110 003.



THAILAND

Cap: Bangkok; **Area:** 542,373 sq. km; **Pop:** 50584000; **Lang:** Thai; **Rel:** Buddhism and Islam; **Currency:** Baht, US\$1=28.25 Bahts

Thailand, formerly known as Siam, is a constitutional monarchy in southeast Asia and has for its neighbours, Burma, Laos and Kampuchea. The Gulf of Siam lies to the south.

Thailand, an ancient autocracy, became a constitutional monarchy in 1932. In 1948 the country assumed its present name Thailand.

Agriculture is the mainstay of the country and engages 60 per cent of the population. The chief crop is rice, much of which is exported. Coconuts, tobacco, cotton and teak are other items of agricultural exports. During the last decade Thailand increased her export of manufactured and processed items. Minerals include tin, manganese, tungsten, antimony, lignite and lead.

Head of State: King Bhumibol Adulyadej Abuldet. **PM:** Prem Tinsulanonda.

Mission in India: Embassy of Thailand, 56-N, Nyaya Marg, Chanakyapuri, New Delhi-110 021.

Consulate: Bombay—'Paresh' 6th Floor, 4A Bhulabhai Desai Road.

Calcutta: 18 B Mandeville Gardens.

TOGO

Cap: Lome; **Area:** 56,600 sq. km; **Pop:** 2838000; **Lang:** French (official) and Tribal; **Rel:** Tribal and Christian; **Currency:** Franc CFA, US\$1=523.75 FCFA.

The Republic of Togo, formerly Togoland, lies on the west coast of Africa forming a narrow strip stretching from the Gulf of Guinea north to Burkina Faso with Ghana to the west and Benin to the east. Togo became independent in 1960.

The principal products are coffee, cocoa, cotton, palm kernels, kapok and groundnuts. Togo's considerable natural resources are still largely undeveloped but phosphates are being mined in increasing quantities, and now form the country's principal export.

President: Gen. Gnassingbe Eyadema.

TONGA

Cap: Nuku'alofa; **Area:** 748 sq. km; **Pop:** 98750; **Lang:** English and Tongan; **Rel:**

Christian; **Currency:** Paanga, US\$1=1.47 Paanga.

Tonga consists of 169 islands and islets in the south western Pacific Ocean. The Tropic of Capricorn and the International Date Line cross each other very near Tonga.

Tonga became a British-protected state in 1900 and independent state on June 4, 1970.

Tonga is an agricultural country. Vegetables and fruits are grown for local consumption. The most important export crop is copra; next come bananas.

Head of State: King Taufa'ahu Topou IV. **PM:** Prince Fatafehi Tupelehake.

TRINIDAD AND TOBAGO

Cap: Port-of-Spain; **Area:** 5128 sq. km; **Pop:** 1105000; **Lang:** English; **Rel:** Christian; **Currency:** Tri & Tob, Dollar US\$1=TT\$2.40.

Trinidad, the second largest and most southerly of the West Indian Islands (south of Windward Isles) lies very near the north coast of South America. Attached to it for administrative purposes is the island of Tobago. Tobago is often called Robinson Crusoe Island in the belief that this was the island on which Crusoe was stranded. It is just 20 miles from Trinidad. Tobago is famous for its rich avian fauna.

Formerly a British Colony, Trinidad & Tobago achieved independence in 1962 and assumed republican status in 1976.

Industries include oil processing, manufactured goods and tourism. Chief crops are sugar, citrus fruit and cocoa.

President: Ellis Emmanuel Innocent Clarke, **P.M.** George Chambers.

Mission in India: High Commission of Trinidad and Tobago, 131 Jor Bagh, New Delhi-110 003.

TUNISIA

Cap: Tunis; **Area:** 163,610 sq. km; **Pop:** 7042000; **Lang:** Arabic (official) and French; **Rel:** Islam, **Currency:** Dinar, US\$1=0.93 Dinar.

A republic of North Africa, lying on the Mediterranean coast, Tunisia is bounded by Algeria on the west and Libya on the east.

Formerly a French protectorate, Tunisia became autonomous in 1955, and assumed republican status in 1957.

Tunisia is an agricultural country, and

produces wheat, barley, oats, dates, olives, apricots, almonds, figs, peaches, vegetables and alfa grass. The chief minerals are phosphates, iron, lead and zinc. The principal exports are olive oil, wine, phosphates and grains.

President: Habib Ben Ali Bourgiba. **PM:** Mohammed Mzali.

Mission in India: Embassy of Tunisia, 9 Palam Marg, Vasant Vihar, New Delhi-110 057.

TURKEY

Cap: Ankara; **Area:** 779,452 sq. km; **Pop:** 48811000; **Lang:** Turkish and Arabic; **Rel:** Islam. **Currency:** Lira. US\$1=493 Lira.

A republic of south eastern Europe and Asia Minor, Turkey is bounded by the Aegean Sea, the Black Sea, the USSR, Iran, Iraq, Syria, the Mediterranean Sea, Greece and Bulgaria. Turkey occupies a strategic position, linking as it does Asia and Europe at the Straits of Bosphorus, between the Mediterranean and the Black Sea. The major portion of Turkey lies in Asia Minor.

Asiatic Turkey, that is, Anatolia, was the seat of one of the earliest civilizations known. Istanbul, the present capital, was first known as Byzantium and then as Constantinople. The Ottoman Turks conquered Constantinople in 1453 and founded a Turkish Empire. In 1923 Turkey became a republic.

Agriculture maintains about 64 per cent of the population. The chief products are tobacco, wheat, cotton, olive oil and sugar. Turkey is the world's second largest producer of sultana raisins. Sheep and cattle abound in the plateau of Anatolia and provide mohair for which Turkey is famous. The main minerals are iron ore, copper, chromium, bauxite and coal.

President: Gen. Kenan Evren, **PM:** Turgut Ozal

Mission in India: Embassy of Turkey, Plot 14, No. 50, Nyaya Marg, Chanakyapuri, New Delhi-110 021.

Consulate: Bombay—Mittal Court, C Wing, 10th Floor, Room No. 105, Nariman Point.

Madras: 'Newshad', 115, Lloyds Road.

TUVALU

Cap: Funafuti; **Area:** 26 sq. km; **Pop:** 7349; **Lang:** Tuvaluan, English; **Rel:** Christian;

Currency: Dollar.

Formerly known as the Ellice Islands, Tuvalu is a scattered group of nine small atolls in the Western Pacific Ocean, north of Fiji and east of Solomon Islands. It became independent in 1975 under the name Tuvalu.

The poor quality of the soil permits subsistence farming of coconuts only. Copra and postage stamps are the main foreign exchange earners.

Gov. Gem: Sir Fiatau Penitela Teo, **PM:** Dr. Tomasi Puapua.

UGANDA

Cap: Kampala; **Area:** 241,139 sq. km; **Pop:** 15150000; **Lang:** English and Luganda; **Rel:** Tribal and Muslim; **Currency:** Uganda Shilling. US\$1=565 U. Shillings.

Uganda, an equatorial state in East Africa, is bounded by the Sudan on the north, Zaire in the west, Rwanda and Tanzania on the south and Kenya on the east.

Formerly a British protectorate, Uganda became independent in 1962 and a republic in 1963. A military coup led by Lt. Gen. Tito Okello ousted Milton Obote's Govt. in 1985. Milton Obote had himself come to power after ousting dictator Idi Amin in 1979.

The economy is agricultural. Main products are cotton and coffee. Tea, sugar, vegetable oils, oil seeds, hides, skins and tobacco are exported. Copper is the chief mineral.

President: Lt. Gen. Tito Okello.

Mission in India: High Commission of Uganda, 61 Golf Links, New Delhi-110 003.

UNITED ARAB EMIRATES

Cap: Abu Dhabi; **Area:** 82,880 sq. km; **Pop:** 1255000; **Lang:** Arabic; **Rel:** Islam; **Curren-**



cy: Dirham, US\$1=3.68 Dirham.

The United Arab Emirates consist of seven Sheikdoms in the Persian Gulf—Abu Dhabi, Dubai, Sharjah, Umm al Quwain, Ajman, Fujairah and Ras al Khaimah. The first six Sheikdoms signed the Union agreement on 2nd Dec. 1971. Ras al Khaimah joined the Union only in February 1972.

Abu Dhabi, which is the capital of the Union, is the largest of the Emirates in area. Dubai is the main port of the Union and now has the largest harbour in the Middle East. The economy of UAE is almost entirely dependent on oil.

President: Sheik Zaid bin Sultan al Nahayan (of Abu Dhabi). **PM:** Sheik Rashid bin Said al-Maktourn (of Dubai).

Mission in India: Embassy of UAE, A-7, West-End Colony, Rao Tula Ram Marg, New Delhi-110 021.

Consulate: Bombay—Bungalow No. 7, Jolly Maker Apartment, Cuffe Parade, Colaba.

UNITED KINGDOM

Cap: London; **Area:** 244,108 sq. km; **Pop:** 55624000; **Lang:** English; **Rel:** Christian; **Currency:** Pound Sterling, £1=US\$1.07.

A constitutional monarchy, the United Kingdom comprises the island of Great Britain and Northern Ireland, together with many small islands. It is separated from the coast of Western Europe by the English Channel to the south and by the North Sea to the east. The northern and western shores are washed by the Atlantic Ocean.

Great Britain: is the largest of the islands forming the United Kingdom. It comprises England, Scotland, Wales, the Isle of Man and the Channel Islands. St. George's Channel and Irish Sea lie between the UK and Ireland. Britain is much less than half the size of France or Germany and would fit forty times into the United States of America. Yet, for hundreds of years this island has been a world power. From its shores men set out to lay the foundation of what is now the United States of America, to develop Canada, Australia, New Zealand, the Indian continent and great areas of Africa. British institutions and methods of government have set the pattern for lovers of freedom everywhere. And today, Britain's Queen is Head of a family of several million people, spread all over the world.

Great Britain is a constitutional monarchy. The sovereign is the Head of State and monarchy is hereditary. Actual power is vested in Parliament which is the supreme legislative body in Great Britain. The Parliament consists of two houses—the House of Lords and the House of Commons.

Britain is one of the world's leading industrial and exporting countries. Chief industries are iron and steel, engineering, chemicals, electronics, motor vehicles, aircraft, textiles, cloth and other consumer goods. Its coal mines yield about 128 million tons annually. Although Britain's agriculture and trawler-fishing are highly mechanised, half of the country's food supplies and most of its raw materials are imported. North sea oil is a lately added boon to British economy.

Northern Ireland: is situated in the north-east of Ireland and forms part of the United Kingdom. It comprises six Ulster counties of Antrim, Armagh, Down, Fermanagh, Londonderry and Tyrone. The rest of the island forms the Republic of Ireland. Northern Ireland has been rocked by bloody agitation for union with Catholic Irish Republic. 1985 saw an Anglo-Irish agreement which for the first time gave Dublin a say in the running of the province.

Agriculture is the main occupation in Northern Ireland. Cattle, sheep, hogs, eggs, poultry, potatoes and milk are the important products. Linen, ropes, twines, rayon, clothing, tobacco, aircraft and shipping form the main branches of industry.

Head of State: Queen Elizabeth II, **PM:** Mrs. Margaret Thatcher.

Mission in India: British High Commission, Shantipath, Chanakyapuri, New Delhi-110 021.

Consulates: Bombay—Hong Kong Bank Building, M.G. Road.

Calcutta: 1, Ho Chi Minh Sarani.

Madras: 24, Anderson Road.

USA

Cap: Washington D.C; **Area:** 93,99,317 sq.km.; **Pop:** 23,56,81,000; **Lang:** English; **Rel:** Christian; **Currency:** Dollar.

The United States of America is a federal republic composed of 50 states, of which all except one—Hawaii islands—are in mainland America.

The United States of America, which cov-

States of the Union

Name	Capital	Area (Sq.km)	Popula- tion (1980)
Alabama (AL)*	Montgomery	133000	3890061
Alaska (AK)	Juneau	1524640	400481
Arizona (AZ)	Phoenix	295000	2717866
Arkansas (AR)	Little Rock	135000	2285513
California (CA)	Sacramento	410090	23668562
Colorado (CO)	Denver	296000	2888834
Connecticut (CT)	Hartford	13000	3107576
Delaware (DE)	Dover	6900	595225
District of Columbia (DC)	Washington D.C.	179	637651
Florida (FL)	Tallahassee	152200	9739992
Georgia (GA)	Atlanta	152487	5464265
Hawaii (HI)	Honolulu	16702	965000
Idaho (ID)	Boise	215000	943935
Illinois (IL)	Springfield	146075	11418461
Indiana (IN)	Indianapolis	93993	5490179
Iowa (IA)	Des-Moines	145790	2913387
Kansas (KS)	Topeka	213063	2363208
Kentucky (KY)	Frankfort	104622	3661433
Louisiana (LA)	Baton Rouge	125665	4203972
Maine (ME)	Augusta	86000	1124660
Maryland (MD)	Annapolis	27394	4216446
Massachusetts (MA)	Boston	21000	5737037
Michigan (MI)	Lansing	151000	9258344
Minnesota (MN)	St. Paul	218576	4077148
Mississippi (MS)	Jackson	123000	2520638
Missouri (MO)	Jefferson city	180000	4917444
Montana (MT)	Helena	380000	786690
Nebraska (NE)	Lincoln	200000	1570006
Nevada (NV)	Carson City	285000	799184
New Hampshire (NH)	Concord	24905	920610
New Jersey (NJ)	Trenton	21285	7364158
New Mexico (NM)	Santa Fe	314000	1299968
New York (NY)	Albany	128490	17557288
North Carolina (NC)	Raleigh	135000	5974429
North Dakota (ND)	Bismarck	183000	652695
Ohio (OH)	Columbus	107177	10797419
Oklahoma (OK)	Oklahoma city	181440	3025266
Oregon (OR)	Salem	251000	2632663
Pennsylvania (PA)	Harrisburg	117400	11866728
Rhode Island (RI)	Providence	3156	947154
South Carolina (SC)	Columbia	80736	3119208
South Dakota (SD)	Pierre	199550	690178
Tennessee (TN)	Nashville	109400	4590750
Texas (TX)	Austin	680000	14228383
Utah (UT)	Salt Lake City	220000	1461037
Vermont (VT)	Montpelier	24983	511456
Virginia (VA)	Richmond	106119	5346279
Washington (WA)	Olympia	176000	4130163
West Virginia (WV)	Charleston	62870	1949644
Wisconsin (WI)	Madison	146000	4705335
Wyoming (WY)	Cheyenne	251228	470816

* Postal two letter (both capitals) abbreviations for U.S. states were introduced with the ZIP Code in 1963. These are fast replacing the older abbreviations



ers the central part of North America, grew out of the British colonies that were established in North America in the first half of the 17th century.

USA's participation in the First World War and the victory of the Allies made it a world power. The end of the Second World War saw the emergence of USA as one of the super-powers of the world.

The Union originally comprised 13 states, to which 7 were added subsequently. Thirty other states, which were formerly territories were also admitted into the Union as full states, thus making up 50 states in all, apart from the District of Columbia. Each state has its own constitution. The State constitutions provide for a legislature of two Houses, (except Nebraska which has only one House), a Governor and a judicial system of its own. The state governments can deal with all matters which are not reserved to the federal legislature. The following table gives the existing states of the Union with their postal abbreviations, capitals, area and population

President: Ronald Reagan. Vice-president: George Bush

Mission in India: Embassy of USA, Shantipath, Chanakyapuri, New Delhi-11021

Consulates: Bombay- Lincoln House, 78 Bhulabhai Desai Road,

Calcutta: 5/1 Ho Chi Minh Sarani;

Madras: 220, Mount Road

USSR

Cap: Moscow; **Area:** 2,24,00,000 sq.km.; **Pop:** 27,57,61,000; **Lang:** Russian; **Rel:** (see below); **Currency:** Ruble. US \$1=0.92 Ruble.

USSR, the largest country in the world in point of area, stretches across the continents

of Asia and Europe. The country extends for over 9600 Km from the Baltic Sea to the Pacific Ocean and for 4800 Km from north to south. In the west it reaches the Gulf of Finland in Europe and in the east the North Pacific Ocean in Asia. In the far north east, the Bering strait separates it from Alaska.

The Soviet Union includes within its boundaries 15 Union Republics, 20 Autonomous Republics and 8 Autonomous Regions.

These are the 15 Republics and their capitals: ★RSFSR-Moscow; Ukraine-Kiev; Uzbekistan-Tashkent; Kazakhstan-Alma-ata; Belorussia-Minsk; Azerbaijan-Baku; Georgia-Tibilisi; Moldavia-Kishinev; Tadzhikistan-Dushanbe; Kirgizia-Frunze; Lithuania-Vilnius; Armenia-Yerevan; Turkmanisa-Ashkhabad; Latvia-Riga; Estonia-Tallinn.

Constitution and Government: The Communist party with 18.4 million members (1984) plays a leading role in government and is the substantial policy-making body. The supreme organ of the party is the Congress which lays down policy and elects the Central Committee. The Central Committee forms the Politbureau and the Secretariat.

Economy: USSR has a planned economy. Planning is based on public ownership in industry and trade and on state and collective or co-operative ownership in agriculture.

Languages: Russian is the dominant language of the Union. Other national languages which number about 130 are also spoken and written.

Union Republics of USSR

Republic	Area sq. km.	Population (million)
Russian SFSR	17075000	142.1
Ukrainian SSR	603700	50.7
Kazakh SSR	2717300	15.6
Uzbek SSR	447400	17.5
Byelorussian SSR	207600	9.9
Azerbaijan SSR	86600	6.5
Georgian SSR	69700	5.2
Moldavian SSR	33700	4.1
Lithuanian SSR	65200	3.5
Kirghiz SSR	198500	3.9
Tadzhik SSR	143100	4.4
Armenian SSR	29800	3.3
Latvian SSR	63700	2.6
Turkmen SSR	488100	3.1
Estonian SSR	45100	1.5

★ Russian Federation of Soviet Republics.

US-a Net Debtor

The United States foreign trade registered a near-record 31.8-billion dollar deficit from April to June, confirming that the country has now become a net debtor for the first time in 71 years, the government reported in Sept. 1985.

The commerce department said the deficit in the current account was 4.9 per cent higher than the 30.3-billion-dollar imbalance suffered in the first three months of the year.

The current account measures not only trade in merchandise but also in services, mainly investment earnings.

Since the country began the year with only a 28.2-billion-dollar surplus in investments, the \$62.1 billion in deficits has undoubtedly for the first six months of the year wiped that surplus out. The commerce secretary, Mr. Malcolm Baldrige said in June that it appeared the country had become a net debtor but economists could not pinpoint when the country crossed over. The fresh report provided further confirmation that the country is now a net debtor for the first time since 1914.

What that means is that the U.S. now owes foreigners more than they owe this country.

The current account deficit is likely to top \$120 billion making the United States the world's leading debtor nation, substantially ahead of the previous leaders, Brazil and Mexico.

(AP: Sept. 16, 1985)

Religion: All religions including, no religion, are permitted in the USSR. Separate figures showing the adherents of various faiths are not available.

The new Constitution adopted by the Supreme Soviet of the USSR on the 7th Oct. 1977 spells out "statutory obligations on deputies, enterprises and officials for fulfilment of the electors' mandates".

Modern Babel

Between the Ukrainian language, spoken by 40 million people, and the Eskimo language, mother-tongue of just 1,300 people, there are 161 non-Russian languages spoken in the Soviet Union.

Contrary to western allegations, no language group, however small, has been "assimilated" by Russian, the largest language group, reports APN. For all such groups, Russian is only a "second" language, one which facilitates communication between the numerous nationalities.

Chairman of the Presidium of the Supreme Soviet (Head of State): Andrei Gromyko **General Secretary, CPSU Central Committee:** Mikhail Gorbachev **P.M.:** Nikolai Ryzhkov.

Mission in India: Embassy of the USSR, Shantipath, Chanakyapuri, New Delhi-110 021.

Consulate: Bombay- Palm Beach, 42, L. Jagmohandas Marg (Old Nepean Sea Road),

Calcutta: 31, Shakespeare Sarani;

Madras: 14, Santhome High Road.

URUGUAY

Cap: Montevideo; **Area:** 1,76,215 sq.km.; **Pop:** 29,90,000, **Lang:** Spanish, **Rel:** Christian; **Currency:** Nuevo Peso. US\$1=90.05 NP

Uruguay is the smallest republic in South America. It lies on the north bank of the estuary of the River Plate with Brazil to the north and Argentina to the west.

Uruguay, once a part of the Spanish Empire and later a province of Brazil, became independent in 1825.

Livestock raising is Uruguay's principal occupation and takes up 60 per cent of its total land area. The chief products are meat, wool, hides, corn, wheat, citrus fruit, rice, tobacco, oats and linseed. Important industries are vinery, meatpacking and textiles.

President: Julio Maria Sanguinetta.

VANUATU

Cap: Villa, **Area:** 14 760 sq km **Pop:** 117000 **Lang:** English, Pidgin; **Rel:** Christian; **Currency:** Vatu.

New Hebrides became independent

under the name Vanuatu on July 1, 1980. It is a double chain of 13 large and 80 small islands in the Pacific. The largest island is the Espiritu Santo. Originally a haunt of European pirates, they came under the control of France and Britain in 1906.

The population is overwhelmingly Melanesian. The major cash crops are copra, coffee and cocoa. Piggery is well developed. Manganese has been mined since 1961 and exported to Japan.

PM: Walter Hadye Lini.

THE VATICAN CITY

Cap: Vatican City; **Area:** 0.4 sq. km; **Pop:** about 1000; **Lang:** Italian and Latin; **Rel:** Christian.

Vatican City, the City of the Pope, is an independent sovereign state and includes St. Peter's Cathedral, Vatican Palace and Museum, the Vatican Gardens and neighbouring buildings. Vatican has its own railway station, postal system and police.

Supreme Pontiff: Pope John Paul II (Karol Wojtyla). **Secretary of State:** Cardinal Agostino Casaroli.

VENEZUELA

Cap: Caracas; **Area:** 912,050 sq. km; **Pop:** 17819000; **Lang:** Spanish; **Rel:** Christian; **Currency:** Bolivar, US\$1=13.40 Bolivar.

Venezuela (sixth largest country in South America) is the northernmost state of South America and is surrounded by Guyana, Brazil and Colombia. The Caribbean Sea bounds it on the north. Formerly a Spanish colony, Venezuela (Little Venice) became independent in 1821.

Venezuela is rich in minerals. It is one of the world's leading producers of oil and is a



member of the OPEC. Oil prosperity is evident everywhere. Venezuela is rich in diamonds and ranks 8th in world production. Other minerals are iron, steel, aluminium, copper, tin and manganese. Agricultural products include coffee, cocoa, black beans, bananas, maize, rice and sugar.

President: Jaime Lusinchi.

Mission in India: Embassy of Venezuela, N-114, Panchashila Park, New Delhi-110 017.

Vietnam

Cap: Hanoi; **Area:** 329,566 sq. km; **Pop:** 58307000; **Lang:** Vietnamese; **Rel:** Buddhist; **Currency:** Dong. US\$1=10.93 Dong.

The Socialist Republic of Vietnam (now comprising former North and South Vietnam) is bordered by China, Laos, Kampuchea and South China Sea.

Vietnam is a mountainous country. Running almost its entire length, is a mountain chain—the Annamite Chain. On one side of the mountain chain is the fertile Red River delta in the north and on the other side is the Mekong delta in the south. The two deltas form the rice bowl of the country.

The country is primarily agricultural. Rice is the dominant crop and an export item. Other crops are rubber, sugarcane, coffee and tea. Minerals include coal, tin, copper, chromium and phosphates in the north. Industries like cement, metallurgy, chemicals, paper and textiles are found in the south.

Presidium of the Republic Chairman: Truong Chinh. **PM:** Phan Van Dong.

Mission in India: Embassy of Vietnam, 35 Prithviraj Road, New Delhi-110 011

WESTERN SAMOA

Cap: Apia; **Area:** 2835 sq. km; **Pop:** 156349; **Lang:** Samoan and English; **Rel:** Christian. **Currency:** Tala (Dollar). US\$1=2.21 Tala

Western Samoa comprises 4 islands in the South Pacific Ocean, the largest of them being Savaii and Upolu. The International Date Line passes very near to Western Samoa. Eastern Samoa (American Samoa) with its capital at Fagotogo remains a dependency of the USA.

Western Samoa became fully independent on January 1, 1962 and is a member of the Commonwealth.

The economy is mainly agricultural. The

chief products are fish, copra, cocoa, bananas, taro, sweet potatoes, bark cloth and mats.

Head of State for life: Malietoa Tanumafili II. **PM:** Tofilau Eti Alesana.

YEMEN (NORTH)

Cap: Sana'a; **Area:** 200,000 sq. km; **Pop:** 6386000; **Lang:** Arabic; **Rel:** Islam; **Currency:** Rial. US\$1=6.45 Rial.

The Yemen Arab Republic is in the south west of the Arabian peninsula. It is bounded by South Yemen on the south and east, Saudi Arabia on the north and east and the Red Sea on the west. The Yemen Arab Republic was established on Sep. 27, 1962.

The main agricultural products are coffee, dates, herbs, fruits, millet and maize. Cotton, coffee, hides and skins are exported.

Head of State: Ali Abdullah Saleh. **PM:** Maj. Abdel Aziz Abdel Ghani.

Mission in India: Embassy of Yemen Arab Republic, 25, 11 Mahatma Gandhi Marg, Lajpat Nagar, New Delhi-110 024.

Consulate: Bombay-102 Maker Towers, 'F', 10th Floor, Cuffe Parade.

YEMEN (SOUTH)

Cap: As Shaab (Aden); **Area:** 463,576 sq. km; **Pop:** 2066000; **Lang:** Arabic; **Rel:** Islam. **Currency:** Dinar. US\$1=0.343 Dinar.

The People's Republic of Yemen, South Yemen for short, comprises a strategic port (Aden) and a large area of mainly desert territory on the southern shore of the Arabian peninsula. Its neighbours are North Yemen to the north-west, Saudi Arabia to the north, and Oman to the east. The Gulf of Aden lies to the south.

South Yemen (formerly Aden and the Protectorate of South Arabia) became independent on Nov. 30, 1967.

The economy is chiefly agricultural. The main crops are sorghum, sesame, millets, wheat and barley.

Chairman of the Presidium of the Supreme People's Council and PM: Ali Nazari Mohammed.

Mission in India: Embassy of People's Democratic Republic of Yemen, B-55, Puschami Marg, Vasant Vihar, New Delhi-110 057

YUGOSLAVIA

Cap: Belgrade; **Area:** 256,804 sq. km; **Pop:** 23,028,000. **Lang:** Serbo-Croat; Slovene and Macedonian; **Rel:** Christian and Muslim; **Currency:** Dinar.

Yugoslavia, a Balkan state, is made up of six republics—Serbia, Croatia, Slovenia, Montenegro, Bosnia-Herzegovina and Macedonia. It lies between Italy, Austria, Hungary, Romania, Bulgaria, Greece and Albania with a long seacoast on the Adriatic side.

The modern state of Yugoslavia has grown out of a petty principality Serbia which was independent since 1878.

Nearly one-third of Yugoslavia is forest. The chief crops are wheat, maize, and potatoes. The principal minerals are coal, iron, manganese and lead.

President: Vojko Srzentic, **PM:** Mrs. Milka Planinc.

Mission in India: Embassy of Yugoslavia, 3-50 Niti Marg, Chanakyapuri, New Delhi-110 021.

Consulate: Bombay—Vaswani Mansions, 120/4 Dinsha Wachha Road.

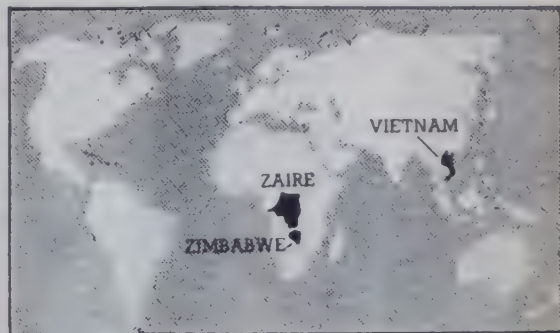
Calcutta: 6, Ballygunge, Park Road.

ZAIRE

Cap: Kinshasa; **Area:** 2,344,885 sq. km; **Pop:** 32,084,000; **Lang:** French & Kiswahili; **Rel:** Christian & Animist; **Currency:** Zaire. US\$1=44.86 Zaire.

The Republic of Zaire was known until Oct. 1971 as the Democratic Republic of the Congo, or Congo (Kinshasa) for short. This change of name distinguished it from its neighbour, the Republic of the Congo or the Congo (Brazzaville). Zaire is surrounded by the Central African Republic, Sudan, Uganda, Rwanda, Burundi, Tanzania, Zambia, Angola, the Congo and the Atlantic Ocean into which the River Congo drains. In 1971 the country changed the name of River Congo to River Zaire. Originally a Belgian colony, Zaire became independent on June 30, 1960.

The major assets of Zaire are the Katanga copper mines and the diamond deposits in Kasai. The country is rich in other minerals like cobalt, cadmium, manganese, zinc and uranium. The forests abound in high class wood like mahogany, ebony and teak. Prin-



cipal agricultural products are coffee, palm oil and rubber.

President: Mobutu Sese Seko, **PM:** Ken- go Wa Dondo.

Mission in India: Embassy of Zaire, 160 Jor Bagh, New Delhi-110 003.

ZAMBIA

Cap: Lusaka; **Area:** 752,620 sq. km; **Pop:** 6,445,000; **Lang:** Bantu and English; **Rel:** Christian and Muslim; **Currency:** Kwacha. US\$1=3.51 Kwacha (after devaluation of Kwacha by 56% in Oct. 1985).

Zambia, a landlocked republic in south central Africa, takes its name from the River Zambezi, one of its biggest rivers. Originally known as Northern Rhodesia, it is separated from Zimbabwe by the Zambezi river. Kariba Dam, one of the biggest man-made dams in the world, is on the Zambezi river where it makes the border between Zambia and Zimbabwe. It is bounded by Tanzania, Malawi, Mozambique, Zimbabwe, Botswana, Namibia, Angola and Zaire.

Zambia became independent on 24th October 1964 and it is a republic within the Commonwealth.

Principal agricultural products are maize, tobacco, millet, cassava, groundnuts, cotton and sugar.

The country is rich in minerals including copper, zinc, cobalt, lead, uranium and manganese. Although copper mining dominates Zambia's economy, now accounting for 80% of the foreign exchange earnings, the country had made a major shift to agricultural production, as a result of the crippling fluctuations of copper prices in the world market.

President: Kenneth David Kaunda, **PM:** Nalumino Mundia

Mission in India: High Commission of Zambia, 14 Jor Bagh, New Delhi-110 003.

ZIMBABWE

Cap: Harare; **Area:** 390,272 sq. km; **Pop:** 8461000; **Lang:** English and Bantu; **Rel:** Tribal and Christian; **Currency:** Dollar. US\$1=Z\$1.65.

Zimbabwe, formerly Southern Rhodesia, lies in south central Africa with Mozambique to the east, Zambia to the north-west, Botswana to the south-west and South Africa to

the south. Zimbabwe achieved independence after a bitter struggle against the white minority government in power.

Zimbabwe is rich in minerals notably copper, nickel, gold, asbestos, chrome and coal. The Wankie Colliery is the largest coal mine in the world. Industries include food processing, metals, textiles and engineering. Maize, groundnuts, cotton, and tobacco are the chief crops, tobacco being the most important one.

President: Canaan Banana **PM:** Robert G. Mugabe.

77. DEPENDENCIES

All dependencies are remnants of the colonial empires established by European powers. None of them are sovereign. Dependencies listed below are grouped under the following heads: 1. Australia, 2. Britain, 3. Chile, 4. Denmark, 5. Ecuador, 6. France, 7. Netherlands, 8. New Zealand 9. Norway, 10. Portugal, 11. Spain, 12. U.S.A.

1. Australia

Australian Antarctic Territory. Area: 6,442,372 sq. km. A barren wasteland in Antarctica claimed by Australia in 1936.

Christmas Island. Area: 135 sq. km; Pop: 3260. An island in the Indian Ocean which Australia acquired in 1958. It is noted for its phosphate production.

Cocos (Keeling) Islands. Area: 14 sq. km. Pop: 1038; Cap: Bantam. The territory comprising 27 small islands in the Indian Ocean was given to the Clunies-Ross family by Queen Victoria in 1886. Australia bought the islands for 7.2 million dollars in 1978.

Heard and McDonald Islands. Area: 368 sq. km. These islands in the Indian Ocean are uninhabited. They were transferred to Australia by Britain in 1947.

Norfolk Islands. Area: 30 sq. km; Pop: 2287; Cap: Kingston. These islands about 1600 Km from Australia are in the Tasman sea. There had been a settlement since 1856 when the descendants of the Bounty mutineers were transferred there from Pitcairn. (See Pitcairn infra)

2. Britain

Most of the British colonies have acquired Associate status and are no longer treated as

dependencies.

Anguilla. Area 91 sq km, Pop 6758; Cap The Valley. Anguilla is one of the northernmost Caribbean islands. In 1976 Britain granted Anguilla local autonomy, with an elected Assembly. Anguillians have been demanding complete independence. Fishing is the main industry.

British Antarctic Territory. Area over 100,000 sq. km. This territory comprises South Shetland Islands, South Orkney Islands and a large slice of territory on Palmer Peninsula, in Antarctica. They are mostly uninhabited. *British Indian Ocean Territory.* Area: 78 sq km; Pop: 2000. This territory in the Indian Ocean about 1120 Km south of India covers the Chagos Archipelago. The three main islands in this group are Diego Garcia, Peros Banhos and Salomon. Diego Garcia is a U.S. naval base now.

British Virgin Islands. Area: 153 sq. km. Pop: 12,796. Cap: Road Town. These comprise 36 islands and islets in the Caribbean Sea. It is governed by a crown administrator aided by a local council and a partly elected legislature. Livestock, fishing and farming form the main occupations.

Cayman Islands. Area: 259 sq. km.; Pop: 11,194. Cap: Georgetown. The Cayman Islands in the Caribbean Sea comprise three

main islands—Grand Cayman, Little Cayman and Cayman Brac. It is governed by an administrator assisted by a local council and an elected Assembly. The population is polyglot. Tourism is the main industry.

Falkland Islands. Area: 11,961 sq. km; Pop: 2010; Cap: Stanley. Falklands Crown Colony comprises two principal islands, East Falkland and West Falkland. South Georgia a whaling settlement and South Sandwich Islands form part of the colony. These islands were settled at different times by the French, the British and the Argentinians. Argentina still claims these islands, which they call *Malvinas*.

In 1982 Argentina forcibly occupied these islands but they were finally reoccupied by Britain. The islands continue to be a bone of contention between Argentina and Britain.

Gibraltar. Area: 6 sq. km; Pop: 31,441. The Rock of Gibraltar, known as the key of the Mediterranean, is a peninsula jutting into the Mediterranean from Spain's southwest coast. Both Spain and France have laid claim to it. In 1967, a referendum voted overwhelmingly in favour of British control. This has not satisfied Spain, which still counts Gibraltar as part of its territory.

Hon Kong (see *Independent States*)

Pitcairn Islands. Area: 48 sq. km; Pop: 124; Cap: Adamstown. Pitcairn Islands include Pitcairn proper as well as three uninhabited islands, Henderson, Ducie and Oeno. They are about 1920 Km south of Tahiti. Pitcairn was located by the mutineers on H.M.S. Bounty, in 1790, when they were looking for an unknown hideout for themselves. They knew that if they were captured by the British navy, they would all be hanged. Therefore, after a sojourn of a few days at Tahiti, from where they took some women, they retired to Pitcairn, which was uninhabited then. When Britain acquired control of the island in 1898, they transferred the descendants of the mutineers to Norfolk Island.

St. Helena. Area: 122 sq. km, Pop: 3200. Cap: Jamestown. St. Helena is in south Atlantic about 1920 Km west of Africa. St. Helena includes Ascension Island about 1120 Km northwest of St. Helena and Tristan du Cunha and three other islands. St. Helena is famous in history as the island to which Napoleon was exiled after his defeat at Waterloo in 1815.

Turks and Caicos Islands. Area: 430 sq. km; Pop: 6228; Cap: Cockburn Town. The main islands of this group, in the Caribbean Sea, are Grand Turk and Salt Cay (Turks) and south and north Caicos (Caicos). In 1962, the islands were granted partial autonomy being administered by a Crown representative with the help of a local council and partly elected legislature. The population is mostly black. Salt, crayfish and sisal are the major exports.

3. Chile

Easter Island. Cap: Hanga-roa; Area: 163 sq. km; Pop: 1000. Easter Island is a volcanic island in the south Pacific about 3760 Km west of Chile. Its archaeological remains show that it had a very ancient civilization. The main occupation today is cultivation.

Juan Fernandez. Area: 148 sq. km; Pop: 615. This group of islands is located about 640 Km west of the Chilean coast. It contains two major islands—Robinson Crusoe and Alexander Selkirk. Daniel Defoe is believed to have based his story of Robinson Crusoe on the four-year confinement of the Scottish sailor Alexander Selkirk on the Robinson Crusoe island. Lobster fishing is the main occupation of the islanders.

Chilean Antarctic Territory. Area: 1,249,993 sq. km; Pop: 200—This is the portion of the Palmer peninsula of the Antarctic that Chile has claimed for its own.

Diego Ramirez Islands. This is a group of uninhabited islands, lying some 100 Km southwest of Cape Horn.

Salay Gomez, San Ambrosio and San Felix Islands. These are three separate uninhabited islands in the Pacific, which are in the possession of Chile.

4. Denmark

Greenland: Area: 2,175,600 sq. km.; Pop: 59,862; Cap: Godthaab.

Greenland, the largest island in the world, lies to the north of North America. Around 84% of the surface is covered by an ice-cap with an average thickness of 500 feet. Most of the inhabitants are of mixed European and Eskimo origin. The main industry is fishing.

In 1979, Denmark handed over local government to the Greenlanders. Greenlandic (Eskimo language) replaced Danish as the

official language. Foreign relations are controlled by Denmark.

Faeroe Islands. Area: 1399 sq.km.; Pop: 41,929; Cap: Thorshavn. Faeroe islands lie in the Atlantic between Scotland's Shetland Islands and Iceland. The islands are 19 in number of which 17 are inhabited. The largest island is Stromo on which the capital Thorshavn stands. The main industry is fishing. The principal language is Faeroese. Home rule was granted in 1948. An elected Parliament controls the local administration. Two Faeroese delegates sit in the Danish Parliament.

5. Ecuador

Galapagos Islands. Area: 7842 km.; Pop: 3100; Cap: Baquerizo Moreno. Galapagos islands are a group of 60 volcanic islands, which lie in the Pacific, about 1040 Km. west of Ecuador. They have a unique assortment of fauna and were declared a National Park in 1936, so as to protect its wild life. The giant tortoise found on these islands is said to be the longest living animal in the world with a life span of 200 years.

6. France

French Guiana. Area: 91,000 sq.km.; Pop: 61744; Cap: Cayenne. French Guiana is on the northern coast of South America. Devil's Island in Guiana served as a penal colony for France, for nearly a hundred years from 1852. In 1946 Guiana was made an overseas department of France with representation in French Parliament.

French Polynesia. Area: 4000 sq.km.; Pop: 1,47,518; Cap: Papeete. The French Polynesian islands numbering around 130 lie in the South Pacific. For administrative purpose they are grouped together as follows. 1. *Windward Islands.* (including Tahiti and Moorea) 2. *Leeward Islands.* 3. *Tuamotu and Gambier Islands.* 4. *Austral Islands* and 5. *Marquesas Islands.* The population is almost entirely Polynesian.

One of these islands-Muruora-about 1150 Km. southeast of Tahiti was used as a nuclear testing site by France in 1966 and 1968, and even as late as 1985.

Guadeloupe. Area: 1799 sq.km.; Pop: 329,634; Cap: Basse-Terre. Guadeloupe proper comprises two islands-Basse-Terre

and Grand Terre-separated by a narrow channel. They are in the Leeward Islands of Lesser Antilles. The islands of Marie Galante, Les Saintes, La Desirade and St. Barthelemy are part of Guadeloupe.

Martinique. Area: 1102 sq.km.; Pop: 3,24,832; Cap: Fort-de-France. Martinique is one of the Windward Islands of Lesser Antilles. The island is mainly known for its volcanic mountain, Mount Pelee, which erupted in 1902 in one of the most devastating earth-quakes known to history. Martinique is an overseas department of France.

Mayotte. Area: 373 sq.km.; Pop: 48518; Cap: Dzaoudzi. Mayotte lies in the Mozambique channel between East Africa and Zanzibar. A part of the Comoro Islands, Mayotte chose to remain a French dependency while the rest of the Comoros became independent in 1975.

New Caledonia. Area: 19058; Pop: 1,47,536; Cap: Noumea. New Caledonia territory comprises several island groups in South Pacific, located about 1200 Km. east of Australia. Besides New Caledonia, there are the Loyalty Islands, about 125 Km. to the east (of New Caledonia), Chesterfield Islands, about 540 Km. to the northwest and the Isle of Pines, about 48 Km. to the south-east. New Caledo-

Kanaky for Caledonia

Melanesian separatists won control of three of four regions of French New Caledonia in elections on September 29, 1985 and immediately pressed demands for total independence for a State they would call Kanaky.

After bitterly-fought regional elections the main separatist party, the Kanak Socialist National Liberation Front emerged with a majority in the north, centre and Loyalty Islands regions of the Pacific territory.

The 50,000 European settlers, around one-third of the total population, found themselves with their backs to the wall despite a major effort to mobilise the vote, for their campaign to remain part of France.

(Reuter, Sept. 30, 1985)

nia has large reserves of nickel, iron, manganese and chrome. An overseas territory of France, it is administered by a governor, assisted by a popularly elected council.

Reunion. Area: 2510 sq.km.; Pop: 5,09,855; Cap: St. Denis. Reunion is a volcanic island in the Indian Ocean and lies about 720 Km. east of Madagascar. The island was settled by France in 1605. About 25 per cent of the population are of French extraction. The island has a prosperous economy based on sugar cane. It was made an overseas department of France in 1946.

St. Pierre and Miquelon. Area: 42 sq.km.; Pop: 5840; Cap: St. Pierre. These islands lie in the Atlantic Ocean about 24 Km. southwest of Newfoundland. Most of the present population are descended from the early French and Basque settlers of the 17th century. Fishing is the main industry. The islands were made a department of France with local autonomy in 1975.

Southern and Antarctic Territory. Area: 7557 sq.km.; Pop: 183; Cap: Port aux Français. This territory comprises two archipelagos in the south Indian Ocean—Kerguelen and Crozet, two islands Saint Paul and New Amsterdam and an area on the mainland of Antarctica. Research stations, hospitals and army bases are located on Kerguelen and New Amsterdam islands. The rest of the territory is uninhabited.

Wallis and Futuna. Area: 200 sq.km.; Pop: 9400; Cap: Mata Utu. Wallis and Futuna are two small groups of islands in the Pacific and lie about 400 Km. west of Samoa. The population is largely Polynesian and the only occupations are connected with copra and fishing. Made an overseas territory of France in 1961, it is governed by an administrator assisted by a council made up of the chiefs of three main islands and three nominated members.

7. Netherlands

Netherlands Antilles. Area: 961 sq.km.; Pop 2,63,504; Cap. Willemstad. Netherlands Antilles consists of two groups of islands in the Caribbean sea—Windward Islands and Leeward Islands. The Windward Islands comprise Curacao, Aruba and Bonaire, Leeward Islands include Saba, St. Eustatius and St. Maarten (part of St. Martin Island shared with Guadeloupe) The Windward Islands

are volcanic and largely arid but Curacao and Aruba yield oil and have a prosperous economy based on petroleum and phosphate. Mining is another paying occupation. The Netherlands Antilles became a co-equal part of the Kingdom of Netherlands in 1954. The movement for independence is gaining ground in the islands.

8. New Zealand

Cook Islands. Area: 234 sq.km.; Pop: 18,127; Cap: Avarua. The Cook Islands are a group of small islands in South Pacific. Rarotonga is the largest island on which the capital Avarua stands. They became a British protectorate in 1888 and were annexed to New Zealand in 1901. Under a constitution adopted in 1965, the islands have full internal self-government in association with New Zealand.

Niue. Area: 259 sq.km.; Pop: 3556; Cap: Tutukia. Niue, geographically part of the Cook islands, has been separately administered since 1903. In 1974, Niue was granted self-government with a Prime Minister and a 14-member elected assembly.

Ross Dependency. Area: 4,14,398 sq.miles. This territory consists of part of the mainland of Antarctica and some islands. New Zealand claimed this territory in 1923. The region includes a whaling centre and a research station.

Tokelau. Area: 10 sq.km.; Pop: 1700; This territory comprises 3 atolls about 480 Km. north of Western Samoa. Once part of the Gilbert and Ellice islands, they were made New Zealand territory in 1925. The population is Polynesian. Copra is the major export.

9. Norway

Bovet Island. Uninhabited island in South Atlantic. Became a dependency of Norway in 1930

Peter I Island. Uninhabited island in Antarctica. Became a dependency in 1933.

Queen Maud Land. An area in Antarctica claimed by Norway in 1939.

10. Portugal

Azores Islands. Area: 2336 sq. km; Pop: 250,892; Cap: Ponta Delgade. The islands of Azores are in the Atlantic Ocean, about 1200

Madeira Wine

Madeira, famous for its special brand of wine, is a group of islands in the Atlantic, southwest of Azores. The famous Madeira wine was discovered by the sheerest accident. Some two centuries ago, a consignment of wine sent from Madeira to the West Indies was returned undelivered. When the returned bottles were opened, it was found the wine had acquired a unique flavour. The hot humid air of the tropics had played the trick. Thereafter, the wine was stored and allowed to mature under tropical conditions. And Madeira wine became famous the world over.

Km west of Europe. The Azores group includes 9 main islands and several smaller ones. The U.S. maintains an air base on Terceira island in the Azores. In 1976, internal self-government was granted to the Azores. But the Azoreans are clamouring for independence.

Macao (see *Independent States*)

Madeira Islands. Area: 795 sq. km; Pop: 267,491; Cap: Funchal. Madeira lies in the Atlantic Ocean 960 Km south west of Portugal. The islands comprise two principal islands—Madeira and Portosanto—and several smaller islands, which are uninhabited. In 1976 Portugal granted Madeira full internal autonomy (see Box).

11. Spain

Balearic Islands. These islands are in the Mediterranean off the south coast of Spain. Majorca, Minorca, Ibiza and Formentera are

the largest islands. The islands had a very ancient civilization dating from the Phoenicians. Spain granted limited autonomy to these islands in 1978.

Canary Islands. Area: 7273 sq. km; Pop: 1,256,650; Cap: Las Palmas and Santa Cruz. The Canary Islands lie in the Atlantic off the north west coast of Morocco. Of the 13 islands comprising the group, the largest are Grand Canary, Tenerife and Fuerte Ventura. In 1927 the islands were divided into two provinces—one with its capital at Las Palmas on Grand Canary and the other with its capital at Santa Cruz on Tenerife.

The islands are volcanic and mountainous, the highest peak Pico de Teide in Tenerife rising above the snow level to 12,198 feet.

The islands received the name from the Latin word *Canis*, meaning dog, on account of the fierce dogs that were found there. The species of song birds called *Canary* were first discovered on these islands, centuries ago by the Phoenicians. Spain acquired dominion over the islands in 1479.

12. United States

Guam. Area: 500 sq. km; Pop: 70,000; Cap: Agana. An island in the Indian Ocean administered by U.S. as an 'unincorporated' territory.

Midway Islands. Area: 5 sq. km; Pop: 2356. A group of islands in north Pacific Ocean, an incorporated territory of U.S.

Marshall Caroline and Marina Islands. Area: 1500 sq. km; Pop: 126,440; Cap: Saipan. U.S. Trust Territory in the Pacific under a High Commissioner.

Wake Island. Area: 6 sq. km; Pop: 1763. U.S. unincorporated territory in the Pacific.

78. AWARDS AND HONOURS

Nobel peace prize, the greatest of honours, was won by *Doctors of Peace* in 1985. In this age of nuclear arms race the surprise award was interpreted as a message to Superpowers to desist from the path of global annihilation and devastation.

Officials of the International Physicians for the Prevention of Nuclear War (IPPNW) said that winning the Nobel Peace Prize should bring pressure on both the United States and the Soviet Union to make "real progress" at

negotiations on nuclear arms.

The Brooklyn-based Organisation, founded five years ago by *Dr. Bernard Lown* of Boston and *Dr. Yevgeny Chazov* of the Soviet Union, was awarded the prize for its "con-

siderable service to mankind by spreading authoritative information and by creating an awareness of the catastrophic consequences of atomic warfare".

The committee said it attached particular weight to the fact that the organisation was formed as a result of a joint initiative by Soviet and U.S. physicians, and that it draws support from more than 40 nations.

Dr. Lown and *Dr. Chazov*, both leading cardiologists, formed the group in 1980, vowing to work to prevent nuclear war.

A record 99 candidates were put forward for the prize. The South African anti-apartheid campaigner, Bishop Desmond Tutu, had won the 1984 award.

The 1985 prize is worth \$ 224,000.

Physics: Prof. Klaus Von Klitzing of West Germany's Max-Planck-Institute for solid state research, won the 1985 Nobel prize for Physics for his discovery of the "quantized Hall effect".

Prof. Klitzing's work was said to have 'opened up a new research field of great importance and relevance.'

Prof. Klitzing, 42, studied at the Technical University of Brunswick.

In 1980, he became a professor at the Technical University in Munich before his association with the Planck Institute in Stuttgart.

The Hall effect, has to do with three-dimensional current-carrying conductors and was discovered by E. H. Hall in 1879.

The phenomenon has given rise to the possibility of controlled study by measuring the oscillatory Hall conduction behaviour and characterise extremely thin semiconductor devices.

Prof. Stig Lundqvist, chairman of the Nobel Physics Committee, described Von Klitzing's discovery as 'very, very exciting and all national laboratories jumped at this.'

Chemistry: Two Americans, Professor Herbert A. Hauptman and Professor Jerome Karle shared the 1985 Nobel Prize for chemistry. This was in recognition of their developing revolutionary techniques used to determine the structures of molecules vital to life.

The Royal Swedish Academy of Science has given the chemistry prize to Americans

for three consecutive years. The two winners are not chemists themselves, but physicians.

"Their work is not within chemistry, but important for Chemistry", a committee member said.

Mr. Hauptman, 68, is Professor of Biophysics at New York State University, Buffalo.

Mr. Karle, 67, is the Director of Research for the structure of matter at the U.S. Naval Laboratory in Washington.

The academy said the two prizewinners had developed direct methods for the determination of crystal structure.

"Through Hauptman's and Karle's fundamental achievements, the methods have been developed into practical instruments for determining the structure of molecules within both inorganic and organic chemistry.

Medicine: The 1985 Nobel Prize for Medicine was awarded to Americans Michael S. Brown and Joseph L. Goldstein, for discoveries related to cholesterol metabolism and cholesterol-related diseases, the Karolinska Institute announced.

It said they had 'revolutionised our knowledge about the regulation of cholesterol metabolism and the treatment of diseases caused by abnormally elevated cholesterol levels in the blood'.

The doctors discovered that atherosclerosis and heart attacks may stem from genetic defects in a cell molecule called the low density lipoprotein receptor, or LDL receptor which affects the amount of cholesterol in the blood.

Mr. Brown, 44, and Mr. Goldstein, 45, are both on the staff of the Department of Molecular Genetics at the University of Texas, in Dallas.

Economics: Franco Modigliani of the Massachusetts Institute of Technology won the Nobel prize in economics for his analyses of savings and financial markets.

The Italian-born professor, now an American, was credited with pioneering studies directed primarily towards household savings and the functioning of financial markets.

Modigliani's achievements, the academy said, concern the development of a life-cycle hypothesis of household savings and the formulation of theorems on the valuation of firms and capital costs.

Modigliani's contribution lay in developing a model of how people save for their old age, integrating it into economic theory and drawing and testing implications from this model.

Literature: French novelist Claude Simon won the 1985 Nobel literature prize.

The Academy said he had in his novels "combined the poet's and the painter's creativeness with a deepened awareness of time in the depiction of the human condition"

Simon, who was 72 on October 10, 1985 was born in the former French colony of Madagascar. He had been tipped as a Nobel laureate for several years.

Virtually unknown to many of his own countrymen, he spends most of his time growing wine in the Pyrenees.

French critics have hailed *La route des Flandres* (The Road to Flanders) for its "epic quality" and grouped Simon with other "new novelists", a growing population of writers who believe in abolishing longstanding literary norms such as time, plot and character development.

Simon began writing in 1945, but did not become prominent until 1959 with the publication of *Le Vent* (the Wind) and *Le Herbe* (the Grass).

Nobel Prize Winners Peace

- 1901 Jean H. Dunant (Switzerland) & Frederick Passy (France)
- 1902 Elie Ducommun and A. Gobal (Switzerland)
- 1903 Sir W.R. Cremer (England)
- 1904 Institute of International Law (Belgium)
- 1905 Bertha Von Suttner (Austria)
- 1906 L. Roosevelt (USA)
- 1907 E.T. Moneta (Italy) and Louis Renault (France)
- 1908 K.P. Amoldson (Sweden)
- 1909 August M.F. & A. Beernaert (Belgium)
- 1910 International Peace Bureau (Switzerland)
- 1911 T.M.C. Asser (Holland) & A.H. Fried (Austria)
- 1912 Elihu Root (USA)
- 1913 H. La Fontaine (Belgium)
- 1914-16 No Award
- 1917 International Red Cross (Geneva)
- 1918 No Award

- 1919 Woodrow Wilson (USA)
- 1920 Leon Bourgeois (France)
- 1921 K.H. Branting (Sweden) & Christian L. Lange (Norway)
- 1922 Fridtjof Nansen (Norway)
- 1923-24 No Award
- 1925 Charles G. Dawes (USA) & Sir J.A. Chamberlain (England)
- 1926 Aristide Briand (France) and G. Stresemann (Germany)
- 1927 F. Buisson (France) and Ludwig Quidde (Germany)
- 1928 No Award
- 1929 Frank B. Kellogg (USA)
- 1930 Lars O.J. Soderblom (Sweden)
- 1931 Jane Addams and Nicholas M. Butler (USA)
- 1932 No Award
- 1933 Sir Norman Angell (England)
- 1934 A. Henderson (England)
- 1935 Carl Von Ossietzky (Germany)
- 1936 C. de S. Lamas (Argentina)
- 1937 Viscount Cecil (England)
- 1938 Nansen International Office for Refugees (Geneva)
- 1939-43 No Award
- 1944 International Committee of Red Cross (Switzerland)
- 1945 Cordell Hull (USA)
- 1946 Emily G. Balch and John R. Mott (USA)
- 1947 American Friends Service Committee (USA) & Br. Society of Friends Service Council (England)
- 1948 No Award
- 1949 Lord John Boyd-Orr (England)
- 1950 Ralph J. Bunche (USA)
- 1951 Leon Jouhaux (France)
- 1952 Albert Schweitzer (France)
- 1953 George C. Marshall (USA)
- 1954 Office of the UN High Commissioner for Refugees
- 1955-56 No Award
- 1957 Lester B. Pearson (Canada)
- 1958 Father G. Henri Pire (Belgium)
- 1959 Philip J. Noel-Baker (England)
- 1960 A.J. Luthuli (South Africa)
- 1961 Dag Hammarskjöld (Sweden)
- 1962 Linus C. Pauling (USA)
- 1963 International Red Cross Committee & Red Cross League (Switzerland)
- 1964 Dr. Martin Luther King (USA)

- 1965 United Nations Children's Fund
 1966-67 No Award
 1968 Rene Cassin (France)
 1969 International Labour Organisation
 1970 Norman Ernest Borlaug (USA)
 1971 Willy Brandt (Germany)
 1972 No Award
 1973 Henry Kissinger (USA) & Le Duc Tho (Vietnam) (Tho rejected the prize)
 1974 Eisaka Sato (Former P.M. Japan), Sean MacBirde (Ireland), UN Commissioner for S.W. Africa, Namibia
 1975 Andrie Sakharov (USSR)
 1976 Betty Williams, Mairead Corrigan and Claron Mckeown (Northern Ireland)
 1977 Amnesty International
 1978 Anwar Sadat (Egypt) & Menachem Begin (Israel)
 1979 Mother Teresa (India)
 1980 Adolfo Peren Esquivel (Argentina)
 1981 UN High Commissioner for Refugees
 1982 Alva Myrdal (Sweden) & Garcia Robles (Mexico)
 1983 Lech Walesa (Poland)
 1984 Bishop Desmond Tutu (South Africa)

Physics

- 1901 W.K. Roentgen (Germany)
 1902 H.A. Lorentz and P. Zeeman (Holland)
 1903 A.H. Becquerel, Pierre & Marie Curie (France)
 1904 Lord Rayleigh (England)
 1905 Philipp Lenard (Germany)
 1906 J.J. Thomson (England)
 1907 A.A. Michelson (USA)
 1908 G. Lippmann (France)
 1909 G. Marconi (Italy) and F. Braun (Germany)
 1910 J.D. Van der Waals (Holland)
 1911 W. Wien (Germany)
 1912 Gustaf Dalen (Sweden)
 1913 H. Kamerlingh-Onnes (Netherlands)
 1914 M. von Laue (Germany)
 1915 W.H. Bragg and W.L. Bragg (England)
 1916 No Award
 1917 C.G. Barkla (England)
 1918 Max von Planck (Germany)
 1919 J. Stark (Germany)
 1920 C.E. Guillaume (Switzerland)
 1921 A. Einstein (Germany)
 1922 Niels Bohr (Denmark)
 1923 R.A. Millikan (USA)

- 1924 Karli Siegbahn (Sweden)
 1925 James Franck & Gustav Hertz (Germany)
 1926 Jean B. Perrin (France)
 1927 Arthur Compton (USA) & Charles T.R. Wilson (England)
 1928 O.W. Richardson (England)
 1929 L.V. de Broglie (France)
 1930 C.V. Raman (India)
 1931 No Award
 1932 W. Heisenberg (Germany)
 1933 Paul A.M. Dirac (England) & Erwin Schroedinger (Austria)
 1934 No Award
 1935 J. Chadwick (England)
 1936 V.F. Hess (Austria) and C.D. Anderson (USA)
 1937 C.J. Davisson (USA) and G.P. Thomson (England)
 1938 E. Fermi (Italy)
 1939 E.O. Lawrence (USA)
 1940-42 Award
 1943 Otto Stern (USA)
 1944 Isidor I. Rabi (USA)
 1945 W. Pauli (Austria)
 1946 P.W. Bridgman (USA)
 1947 Sir E. Appleton (England)
 1948 P.M.S. Blackett (England)
 1949 Hideki Yukawa (Japan)
 1950 C.F. Powell (England)
 1951 Sir John Cockcroft (England) and E.T.S. Walton (Ireland)
 1952 E.M. Purcell and Felix Bloch (USA)
 1953 Fritz Zernike (Netherlands)
 1954 S. Max Born (England) and Walther Bothe (Germany)
 1955 Willis E. Lamb and Ploykarp Kusch (USA)
 1956 Walter H. Brattain, William Shockley and John Bardeen (USA)
 1957 Tsung Dao Lee and Chen Ning Yang (USA) (b. China)
 1958 Pavel A. Cerenkov, Ilya M. Frank and Igor E. Tamm (USSR)
 1959 Emilio Segre and Owen Chamberlain (USA)
 1960 Donald A. Glaser (USA)
 1961 Robert Hofstadter (USA) & R.L. Mossbauer (Germany)
 1962 Lev. Dr. Landau (USSR)
 1963 Eugene P. Wigner (USA), Maria Goep-

- pert—Mayer (USA) & J. Hans D. Jenen (Germany)
- 1964 Charles H. Towns (USA), Nikolai G. Basov & A.M. Prokhorov (USSR)
- 1965 Shinichiro Tomonaga (Japan), Julian Schwinger & Richard P. Feynman (USA)
- 1966 Alfred Kastler (France)
- 1967 Hans A. Bethe (W. Germany)
- 1968 Luis W. Alvarez (USA)
- 1969 Murray Gell-Mann (USA)
- 1970 Louis Neel (France) and Hannes Alfvén (Sweden)
- 1971 Denis Gabor (Britain)
- 1972 John Bardeen, John Schrieffer, Leon Cooper (all USA)
- 1973 Leo Esaki (Japan), Ivar Giaever (USA), Brian D. Josephson (UK)
- 1974 Martin Ryle (UK) and Antony Hewish (UK)
- 1975 James Rainwater (USA), Aage Bohr (Denmark) and Ben Mottelson (Denmark)
- 1976 Burton Richter (USA), Samuel C.C. Teng (USA)
- 1977 Philip W. Anderson (USA), Sir Neville Mott (England), John H. Van Vleck (USA)
- 1978 1. Pyotr Leontevitch Kapitsa (USSR) Half the Prize amount, 2. Arno A. Penzias (USA) 3. Robert W. Wilson (USA)
- 1979 Sheldon S. Glashow (USA), Steven Weinberg (USA) & Abdus Salam (Pakistan)
- 1980 James W. Cronin and Val L. Fitch (USA)
- 1981 Nicolaas Blombergen (Holland), Arthur Shawlow (USA) & Kai Siegbahn (Sweden)
- 1982 Kenneth G. Wilson (USA)
- 1983 S. Chandrasekhar (India-born American Professor) and William Fowler (USA)
- 1984 Carlo Rubbia, Simon Van Der Meer (Switzerland)
- 1908 Ernest Rutherford (England)
- 1909 Wilhelm Ostwald (Germany)
- 1910 Otto Wallach (Germany)
- 1911 Marie Curie (France)
- 1912 F.A.V. Gnignard and P. Sabatier (France)
- 1913 Alfred Werner (Switzerland)
- 1914 T.W. Richards (England)
- 1915 R. Willstätter (Germany)
- 1916-17 No award
- 1918 Fritz Haber (Germany)
- 1919 No award
- 1920 Walther Nernst (Germany)
- 1921 Frederic Soddy (England)
- 1922 F.W. Aston (England)
- 1923 Fritz Pregl (Australia)
- 1924 No award
- 1925 R.A. Zsigmondy (Germany)
- 1926 T. Svedberg (Sweden)
- 1927 H. Wieland (Germany)
- 1928 Adolf Windaus (Germany)
- 1929 A. Harden (England) and H. von Euler, Chelpin (Sweden)
- 1930 Hans Fischer (Germany)
- 1931 Kal Bosch and Friedrich Bergius (Germany)
- 1932 Irving Langmuir (USA)
- 1933 No award
- 1934 Harold C. Urey (USA)
- 1935 Frederick & Irene Joliot-Curie (France)
- 1936 Peter J.W. Debye (Germany)
- 1937 Walter N. Haworth (England) and Paul Karrer (Switzerland)
- 1938 R. Kuhn (Germany)—declined
- 1939 Adolf F.J. Butenandt (Germany)—declined—and Leopold Ruzicka (Switzerland)
- 1940-42 No award
- 1943 G.H. De Heves (Hungary)
- 1944 Otto Hahn (Germany)
- 1945 Arturi I. Virtanen (Finland)
- 1946 J.B. Sumner, W.M. Stanley and J.H. Northrop (USA)
- 1947 Sir Roberto Robinson (England)
- 1948 Arne W.K. Tiselius (Sweden)
- 1949 William F. Glauque (USA)
- 1950 Otto Diels & Kurt Alder (Germany)
- 1951 Edward M. McCullum & Glen T. Seaborg (USA)
- 1952 Archer J.P. Martin & Richard L.M. Synge (England)

Chemistry

- 1901 J.H. Vant Hoff (Holland)
- 1902 Emil H. Fischer (Germany)
- 1903 S.A. Arrhenius (Sweden)
- 1904 Sir W. Ramsay (England)
- 1905 Adolf von Baeyer (Germany)
- 1906 Henri Moissan (France)
- 1907 E. Buchner (Germany)

- 1953 Herman Staudinger (Germany)
 1954 Linus C. Pauling (USA)
 1955 Cincint du Vigneaud (USA)
 1956 Sir Cynl Hinshelwood (England) Nikolai N. Semenov (USSR)
 1957 Sir Alexander Todd (England)
 1958 Frederick Sanger (England)
 1959 Jaroslav Heyrovsky (Czechoslovakia)
 1960 Williard F. Libby (USA)
 1961 Melvin Calvin (USA)
 1962 Max F. Perutz & C. Kendrew (England)
 1963 Karl Ziegler (W. Germany) & Giulio Natta (Italy)
 1964 Dorothy C. Hodgkin (England)
 1965 Robert B. Woodward (USA)
 1966 Robert S. Mulliken (USA)
 1967 Manfred Eigen (East Germany), Ronald G. W. Norrish (UK) and George Porter (UK)
 1968 Lars Onsager (USA)
 1969 Derek H.R. Barton (England) and Odd Hassel (Norway)
 1970 Luis F. Leloir (Argentina)
 1971 Gerhard Herzberg (Canada)
 1972 Christian B. Anfinsen, Stanford Moore & William H. Stein (USA)
 1973 Ernst Otto Fischer (W. Germany), Geoffrey Wilkinson (UK)
 1974 Paul J. Flory (USA)
 1975 John Warcup Cornforth (Britain) Vladimir Prelog (Switzerland)
 1976 William N. Lipscomb (USA)
 1977 Ilya Prigogine (Belgium)
 1978 Peter Mitchell (Britain)
 1979 Herbert C. Brown (USA) & George Witting (W. Germany)
 1980 Paul Berg (USA), Walter Gilbert (USA) & Frederick Sanger (Britain)
 1981 Kenichi Fukui (Japan) & Roals Hoffmann (USA)
 1982 Aaron Klug (Britain)
 1983 Prof. Henry Taute (USA)
 1984 R. Bruce (USA)
- Medicine & Physiology**
- 1901 E.A. Von Behring (Germany)
 1902 Sir Ronald Ross (England)
 1903 N.R. Finsen (Denmark)
 1904 Ivan P. Pavlov (Russia)
 1905 Robert Koch (Germany)
 1906 S. Ramon Cajal (Spain) and Camillo Golgi (Italy)
 1907 C.L.A. Laveran (France)
 1908 Paul Ehrlich (Germany) & E. Metchnikoff (France)
 1909 T. Kocher (Sweden)
 1910 A. Kossel (Germany)
 1911 A. Gullstrand (Sweden)
 1912 Alexis Carrel (USA)
 1913 Charles Richet (France)
 1914 R. Barany (Austria)
 1915-18 No award
 1919 Dr. Bordet (Belgium)
 1920 August Krogh (Denmark)
 1921 No award
 1922 A.V. Hill (England) and Otto Meyerhof (Germany)
 1923 Frederic-G. Banting and J.J.R. MacLeod (Canada)
 1924 W. Einthoven (Holland)
 1925 No award
 1926 Johannes Fibiger (Denmark)
 1927 J. Wanger-Jauregg (Austria)
 1928 Charles Nicolle (France)
 1929 Sir F.G. Hopkins (England) and C. Eijkman (Holland)
 1930 Karl Landsteiner (USA)
 1931 Otto H. Warburg (Germany)
 1932 Sir C.S. Sherrington & E.D. Adrian (England)
 1933 T.H. Morgan (USA)
 1934 G.R. Minot, W.P. Murphy & G.H. Whipple (USA)
 1935 Hans Spemann (Germany)
 1936 Sir Henry H. Dale (England) and Otto Loewi (Austria)
 1937 A. Szent-Dvorgyi (Hungary)
 1938 C. Heymans (Belgium)
 1939 G. Domagk (Germany)—declined
 1940-42 No award
 1943 C.P. Henrik Dam (Denmark) and Edward A. Doisy (USA)
 1944 Joseph Erlanger and Herbert Gasser (USA)
 1945 Sir Alexander Fleming, Sir Howard W. Florey (England) and E.B. Chain (Germany)
 1946 Herman J. Muller (USA)
 1947 Carl F. and Gerty T. Cori (USA) & Bernardo A. Houssay (Argentina)
 1948 Paul Mueller (Switzerland)
 1949 Walter R. Hess (Switzerland) & Antonio C.A.F. Moniz (Portugal)

Nobel Medicine for Heart Attack

The winners of 1985 Nobel prize for medicine recommend a diet free of saturated animal fats and eggs to avoid atherosclerosis which causes fatal heart attack.

Prof. Michael Brown and Prof. Joseph Goldstein of USA have found a direct relationship between fatty diet and atherosclerosis, which is caused by the accumulation of cholesterol on the walls of arteries supplying blood to heart muscles.

Over the years, the deposition narrows the channel until a clot suddenly forms, inhibiting blood supply, starving the heart muscles of oxygen and nutrients, and causes a heart attack, mostly fatal, they say.

Cholesterol, the fatty alcohol, is carried within certain particles circulating in the blood, called low-density lipoproteins.

Prof. Brown and Prof. Goldstein reported that studies had revealed that more than half of the people in the industrialised western societies, including the USA, had a level of cholesterol carrying LDL circulating in their blood that put them at high risk of atherosclerosis.

- 1950 Edward C. Kendall, Philip S. Hench (USA) & T. Reichstein (Switzerland)
- 1951 Max Theiler (USA-b. Africa)
- 1952 S.A. Waksman (USA)
- 1953 Hans A. Krebs (England) & Fritz A. Lipmann (USA)
- 1954 J.F. Enders, F.C. Robbins & T.H. Weller (USA)
- 1955 A.H.T. Theorell (Sweden)
- 1956 Andre F. Cournand, D.W. Richards (USA) & Dr. W. Forssmann (Germany)
- 1957 Daniel Bovet (Italy)
- 1958 G.W. Beadle, Joshua Lederberg & E.L. Tatum (USA)
- 1959 Servo Ochoa & Arthur Kornberg (USA)
- 1960 Sir M. Burnet (Australia) & Peter B. Medawar (England)
- 1961 George von Békésy (USA)
- 1962 Francis H.C. Crick (England), Maurice

- H.F. Wilkins (England) and James D. Watson (USA)
- 1963 Sir John C. Eccles (Australia), Andrew F. Huxley & A.L. Hodgkin (England)
- 1964 Konard E. Bloch (USA) & Feodor Lynen (W. Germany)
- 1965 Francois Jacob, Andre Lwoff & Jacques Monod (France)
- 1966 Francis P. Rous & Charles B. Huggins (USA)
- 1967 Ranger Granit (Sweden), Haldon Keffer Hartline and George Wald (USA)
- 1968 Dr. Hargovind Khorana (USA) (b. India), Robert W. Holley & Marshall W. Nirenberg (USA)
- 1969 Dr. Max Delbrück (USA), Dr. Alfred D. Hershey (USA), Dr. Salvador Luria (USA)
- 1970 Sir Bernard Katz (England), Dr. Ulf von Euler (Sweden), Dr. Julius Axelrod (USA)
- 1971 Dr. Eare Wilbur Sutherland (USA)
- 1972 Gerald Edelman (USA), Rodney Porter (Britain)
- 1973 Karl Von Frisch (W. Germany), Zacharias Lorenz (Austria), Nicholas Tinbergen (Netherlands)
- 1974 Albert Claude (Luxembourg), George E. Palade (Hungary), Christian de Duve (Belgium)
- 1975 David Baltimore (USA), Renato Dulbecco (Britain), Howard M. Temin (USA)
- 1976 Baruch s. Blumberg (USA), D. Carleton Gajdusek (USA)
- 1977* Rosalyn S. Yalow (USA), Andrew V. Schally (USA)
- 1978 Werner Arber (Switzerland), Daniel Nathans (USA) and Hamilton O. Smith (USA)
- 1979 Godfrey Hounsfield (Britain), Allan McCormack (USA)
- 1980 Baruf Benacerraf (USA), George Snell (USA), Jean Dausset (France)
- 1981 Roger Sperry, David Hubel (USA) & Torsten Wiesel (Sweden)
- 1982 Sune Bergstroem, Bengt Samuelsson (Sweden) and John R. Vane (Britain)
- 1983 Dr. Barbara McClintock (England)
- 1984 Dr. Niels Jerne (Denmark), Dr. George

* Half the Prize amount went to Rosalyn Yalow, who, incidentally is the 6th woman to receive a Nobel Prize in the sciences. The other half is shared equally by Roger Guillemin and Andrew Schally

Koehler (W. Germany), Dr. Cesar Milstein (Argentina)

Economics

- 1969 Ragnar Frisch (Norway) & Jan Tinbergen (Holland)
- 1970 Dr. Paul A. Samuelson (USA)
- 1971 Simon Kuznets (USA)
- 1972 John R. Hicks (Britain) & Kenneth J. Arrow (USA)
- 1973 Wassily Leontief (USA)
- 1974 Gunnar Myrdal (Sweden) & Friedrich A. Von Hayek (Austria)
- 1975 Leonid V. Kantorovich (USSR), Tjalling C. Koopmans (USA)
- 1976 Milton Friedman (USA)
- 1977 Bertil Ohlin (Sweden) & James E. Meade (England)
- 1978 Herbert A. Simon (USA)
- 1979 Theodore Shulze & Sir Arthur Lewis (USA)
- 1980 Lawrence Klein (USA)
- 1981 James Tobin (USA)
- 1982 George Stigler (USA)
- 1983 Gerard Debreu (USA)
- 1984 Sir Richard Stone (Britain)

Literature

- 1901 Rene F.A. Sully-Prudhomme (France)
- 1902 T. Mommsen (Germany)
- 1903 B. Bjornson (Norway)
- 1904 F. Mistral (France) and Jose Echegaray (Spain)
- 1905 H. Sienkiewicz (Poland)
- 1906 Giosue Carducci (Italy)
- 1907 Rudyard Kipling (England)
- 1908 R. Eucken (Germany)
- 1909 Selma Lagerlof (Sweden)
- 1910 Paul J.L. Heyse (Germany)
- 1911 M. Maeterlinck (Belgium)
- 1912 G. Hauptmann (Germany)
- 1913 Rabindranath Tagore (India)
- 1914 No award
- 1915 Romain Rolland (France)
- 1916 V. Heidenstam (Sweden)
- 1917 Karl Gjellerup and H. Pontoppidan (Denmark)
- 1918 No award
- 1919 Carl F.G. Spitteler (Switzerland)
- 1920 Knut Hamsun (Norway)
- 1921 Anatole France (France)
- 1922 J. Benavente Martinez (Spain)

Price of the Prize

Alfred Bernhard Nobel (1833—1896), inventor of dynamite, who died on December 10, 1896 bequeathed \$9,000,000, the interest to be distributed yearly to those who had most benefitted mankind during the preceding year in different spheres.

Awards for Physics and Chemistry are made by the Swedish Academy of Science; Medicine or Physiology by the Stockholm Faculty of Medicine; Literature by the Swedish Academy of Literature; Peace by five persons elected by the Norwegian Parliament (Storting). The Fund is managed by a board of directors, the head of which is appointed by the Swedish Government. Nobel Prize in Economics, known as the "Alfred Nobel Memorial Prize in Economic Science", was instituted by the Central Bank of Sweden, to mark its tercentenary in 1968. The prize was first awarded in 1969.

- 1923 W.B. Yeats (Ireland)
- 1924 L.S. Reymont (Poland)
- 1925 G.B. Shaw (England)
- 1926 Grazia Deledda (Italy)
- 1927 Henri Bergson (France)
- 1928 Sigrid Undset (Norway)
- 1929 Thomas Mann (Germany)
- 1930 Sinclair Lewis (USA)
- 1931 Erik A. Karlfeldt (Sweden)
- 1932 John Galsworthy (England)
- 1933 Ivan G. Bunin (USSR)
- 1934 Luigi Pirandello (Italy)
- 1935 No award
- 1936 Eugene O' Neil (USA)
- 1937 R.M. du Gard (France)
- 1938 Pearl S. Buck (USA)
- 1939 F.E. Sillanpaa (Finland)
- 1940-43 No award
- 1944 J.V. Jensen (Denmark)
- 1945 Gabriela Mistral (Chile)
- 1946 Hermann Hesse (Switzerland)
- 1947 Andre P.G. Gide (France)
- 1948 T.S. Eliot (England)
- 1949 William Faulkner (USA)
- 1950 Bertrand A. W. Russell (England)
- 1951 Par Lagerkvist (Sweden)

- 1952 Francois Mauriac (France)
- 1953 Sir Winston S. Churchill (England)
- 1954 Ernest Hemingway (USA)
- 1955 Halldor K. Laxness (Ireland)
- 1956 Juan R. Jiminez (Spain)
- 1957 Albert Camus (France)
- 1958 Boris L. Pasternak (USSR)
- 1959 Salvatore Quasimodo (Italy)
- 1960 Saint John Perse (France)
- 1961 Ivo Andric (Yugoslavia)
- 1962 John Steinbeck (USA)
- 1963 Giorgos Seferis (Greece)
- 1964 Jean-Paul Sartre (France)
(Sartre rejected the prize)
- 1965 Mikhail Sholokhov (USSR)
- 1966 Samuel J. Agnon (Israel) & Nelly Sachs
(Sweden)
- 1967 Miguel Angel Asturias (Guatemala)
- 1968 Yasunari Kawabata (Japan)
- 1969 Samuel Beckett (Ireland)
- 1970 Alexander Solzhenitsyn (USSR)
- 1971 Pablo Neruda (Chile)
- 1972 Heinrich Boell (Germany)
- 1973 Patrick White (Australia)
- 1974 Eyvind Johnson & Hary Edmund Martu-
son (Sweden)
- 1975 Eugenio Montale (Italy)
- 1976 Saul Bellow (US)
- 1977 Vicente Aleixander (Spain)
- 1978 Issac Bashevis Singer (USA)
- 1979 Odysseus Elytis (Greece)
- 1980 Czeslaw Milosz (Poland)
- 1981 Elias Canetti (Bulgaria)*
- 1982 Gabriel Garcia Marquez (Colombia)
- 1983 William Golding (Britain)
- 1984 Jaroslav Seifert (Czechoslovakia)

Magsaysay Award: Murahdhar Devidas Amte, Indian Social Activist won Ramon Magsaysay Award for **Public Service** in 1985. Amte has been recognised for his work-oriented revitalization of Indian lepers and other handicapped outcasts. Amte, 71, affectionately called Baba Amte, established rehabilitation centres for the lepers called *Anandvan* and *Somanath* in Chandrapur and *Ashokvan* in South Nagpur in Maharashtra.

Baba Amte's restless service during the last four decades has been placed on the positive philosophy that "Charity destroys, work builds."

* Born in Bulgaria but living in London—writes in German

Following are the other winners of the award for 1985.

International Understanding: Harold Ray Watson, U.S. missionary working in Philippines. **Journalism, Literature and Creative Communication Arts:** Lino Brocka, Philippines. **Community Leadership:** Dr. Zafrulla Chowdhury, Bangladesh. **Government Service:** Tan Sri Ahmad Noordin bin Haji Zakaria, Malaysia.

The award was instituted in 1957 to honour the memory of Ramon Magsaysay, the late President of Philippines. The award consists of a Gold Medal, a Certificate and US\$ 10,000.

Among those who won the award previously are the following **Indians:**

International Understanding: Mother Teresa (1962);

Journalism, Literature and Creative Communication Arts: Amitabha Chowdhury (1961), Satyajit Ray (1967), B.G. Verghese (1975), Gour Kishore Ghosh (1981), Arun Shourie (1982), R.K. Laxman (1984);

Community Leadership: Acharya Vinoba Bhave (1958), Dara N Khurody, Tribhuvandas K Patel and Verghese Kurian (1963), Kamaladevi Chathopadhyay (1966), M.S. Swaminathan (1971), Ela R Bhatt (1977), Rajankant S Arole and Mabelle R Arole (1979);

Public Service: Jayaprakash Narayan (1965), M.S. Subbalakshmi (1974); Manibhai Phimbai Desai (1982);

Government Service: C.D. Deshmukh (1959).

Nehru Award: The Jawaharlal Nehru Award for International Understanding was instituted by the Government of India in honour of Jawaharlal Nehru, the first Prime Minister of India. It is given annually for outstanding contribution to the promotion of international understanding, good will and friendship among the peoples of the world. The award is being administered by the Indian Council for Cultural Relations.

The Award carries an amount of Rs. 250,000/- (convertible into Foreign exchange) and a Citation which is presented to the recipient at a special ceremony in New Delhi. Winners:

- 1978: Most Ven Nichidatsu Fuji
- 1979: Nelson R. Mandela
- 1980: Barbara Ward
- 1981: Gunnar Myrdal and Mrs. Alva Myrdal
- 1982: Dr. Leopold Sedar Senghor

1983: Dr. Bruno Kreisky

1984: Mrs. Indira Gandhi (Posthumously)

Kalinga Prize: The Kalinga prize for the Popularization of Science was won by British Professor Sir Peter Medawar, 70, in 1985. The award, one among the Science prizes distributed by UNESCO, carries an amount of £1500.

The Kalinga Prize was instituted by Bijou Patnaik, industrialist and politician, who is the founder and Chairman of the Kalinga Foundation Trust in the state of Orissa. UNESCO awarded the prize for the first time in 1952.

The winner of the prize also receives the UNESCO Gold Medal and is invited to visit India as a guest of Kalinga Foundation Trust.

UNESCO Prize: 15,000-dollar UNESCO Prize, awarded every two years, went to six Australian researchers at the Commonwealth Scientific and Industrial Research Organisation in Brisbane.

They won the prize for work on biological control of the underwater plant, salvinia molesta, in the river Sepik basin in Papua New Guinea.

Finlay Prize: Two Brazilian professors Viktor and Ruth Nussenzweig of the University of Sao Paulo won the 5,000-dollar Carlos Juan Finlay Prize donated by the Cuban Government, for their development of a vaccine against malaria.

U Thant Award: The award originally established by U Thant and named after him since his death, is made to an outstanding Personality who through his or her efforts has contributed to the enhancement of cultural understanding and development between nations.

Mrs. Indira Gandhi received the Award in 1982.

Past recipients of the award included Dr. S. Radhakrishnan, Prof. Arnold Toynbee, Mrs. Barbara Ward, U Nu, Mr. Lester Pearson, Mr. Adlai Stevenson and Mrs. Nancy Weldon Ross.

Third World Prize: The Third World Foundation Prize of \$100,000 for 1985 was given to South-African Black Nationalist leader, Nelson Mandela and his wife Mrs. Winnie Mandela.

The Commonwealth Secretary-General

Shridath Ramphal, Chairman of the Selection Committee praised Mr. Mandela's vision of a non-racial society and his wife's courage and determination as the symbol of the campaign against apartheid. Nelson Mandela, 67, was jailed for life more than 20 years ago on charges of treason and sabotage.

UNESCO Award: General Indarjit Rikhye, a former leader of the U.N.-peace keeping forces, won the annual *UNESCO Peace Prize* for Education in 1985.

General Rikhye who helped to set up the World Peace Academy in New York and has headed it since 1971 shared the award with George Eckert Institute in Brunswick which carries out international text book research. It has worked with UNESCO since the Institute was created.

Freedom Medal: Mother Teresa won the Medal of Freedom, the US's highest civilian decoration in 1985. President Ronald Reagan who presented the medal called her *a citizen of the world*. "Most of the people talk of kindness—but, Mother Teresa *the saint of the gutters* lives it", said Reagan.

Miss World: Blonde Miss Iceland, Holmfríour Hofi Karlsottir won the Miss World contest before a cheering audience in Royal Albert Hall, London, narrowly beating runners up Miss United Kingdom and Miss U.S.A. Miss Karlsottir, a 22-year-old kindergarten school teacher, receives the £5,000 (Rs.86,500) prize and a work contract worth £25,000 (Rs.4.32 lakh) in the competition.

Miss International: Nina Cicilia Fernandez of Venezuela won the *Miss International* contest held in Japan in 1985.

Lenin Peace Prize: The late Prime Minister, Smt. Indira Gandhi won the international Lenin Peace Prize for 1983-84 posthumously, in recognition of the outstanding contribution made to the struggle for preserving and strengthening peace.

Sharing the honour for the year are the Vietnamese Vice-Presidents Mr. Nguyen Huu Tho, Mr. Joseph Weber of W. Germany, Professor Jean-Marie Legait, President of the World Federation of Scientific Workers, Colombian writer, Luis Vidales and Eva Plamer of Sweden.

Asian World Prize: Indo-Anglian poetess Mrs. Kamala Das, also known by her pen-

name Madhavikutty, won the 1985 Asan World Prize for the literary work. Mrs. Kamala Das is the fifth recipient of the Asan World Prize since it was instituted in 1981 in memory of the Kerala poet Kumaran Asan. The previous recipients are: Leopold Sedar Senghor (Senegal), Nicholas Guillen (Cuba), Ethiravire Saradchandra (Sri Lanka) and Judith Wright (Australia).

Pears Award: India's Dr. Mary Varghese won the Robert Pears Award instituted by Wor'd Vision International, in recognition of her dedicated services for the welfare of the handicapped.

Dr. Mary Varghese (60), formerly Head of the Dept. of Physical Medicine and Rehabilitation, Christian Medical College, Vellore, Tamil Nadu, is herself a handicapped person. The award comprises a medal, a citation and US\$10,000.

'Beyond War' Prize: Six heads of state, including Prime Minister Rajiv Gandhi have been honoured by California-based 'Beyond War' pacifist organisation in 1985.

The six leaders—from Mexico, Argentina, India, Sweden, Greece and Tanzania won the 'Beyond War' prizes for their participation in a five-continent peace initiative introduced in India in January 1985.

The six heads of state, who signed the New Delhi declaration for disarmament and peace are Mexican President, Mr. Miguel de La Madrid, Argentine President Mr. Raul Alfonsin, Prime Minister Mr. Rajiv Gandhi, Swedish Prime Minister Mr. Olaf Palme, the Greek Prime Minister Mr. Andreas Papandreou and the former Tanzanian President Mr. Julius Nyerere.

Booker Prize: New Zealand writer, Ken Hulme won Britain's prestigious literary award, the 15,000 pounds Booker prize, for her novel, the Bone People.

It took the 38-year-old Hulme a dozen years to write the novel, a long prose-poem about Maori myths and damaged relationships, encapsuled in a story about a solitary sculptress, an urchin boy and his stepfather.

Poetry-Prize: Lauris Edmond, a university lecturer in her forties from Wellington, New Zealand, won the \$ 5,000 Commonwealth poetry prize for her latest volume, "Selected poems".

Ms. Edmond was given her prize by

Commonwealth secretary-general, Sir Shridath Ramphal for what the chairman of the judging panel and poet, Mr. Peter Paul, called verses "written very much from a woman's point of view in a spontaneous, warm and human voice."

World Media Award: The book, 'Africa in crisis: the causes, the cures of Environmental Bankruptcy', has been awarded the World Hunger Media award for the year at the United Nations headquarters at New York.

The award, worth \$ 10,000 is funded by the western singer, Kenny Rogers, and his organisation, World Hunger Year. The book, published by Earthscan, London, examines the causes of Africa's famine.

Jnanpith Award: Malayalam novelist Thakazhi Sivasankara Pillai won the Jnanpith award for 1984.

The award carries a prize of Rs. 1.50 lakhs. This is the third time the award has gone to a Malayalam writer. The two earlier winners are G. Sankara Kurup and S.K. Pottekkat.

Thakazhi shot into prominence in 1956 when his novel 'Chemmeen' earned him the coveted Sahitya Akademi Award. The novel provided a scintillating story for a movie with the same title which won the President's Gold Medal.

The Jnanpith award has been won four times by Hindi and Kannada and thrice by Bengali writers. It has been received once each by Assamese, Gujarati, Marathi, Oriya, Tamil, Telugu and Urdu writers.

Author of 35 novels and 500 short stories, Thakazhi was born in Thakazhi, in Alleppey district of Kerala in 1914. He started publishing short stories even as a student and his first collection of short stories, 'Puthumalar' (New Flowers) was a sensational success when published in 1934.

His early successful novels included 'Prathiphalam' (Reward), 'Thottiyude Makan' (Scavenger's Son) and 'Kantidangazhi' (Two Measures).

World fame came in 1956 with the publication of 'Chemmeen' which portrays the agony and ecstasy of a fisherwoman's love story. It has remained one of the most widely translated novels.

Yet another classic, 'Kayar' (Coir), was published in 1973. Spanning a period of over 250 years, 'Kayar' is the story of six genera-

ons and has in its canvas some 1,000 characters.

The Jnanpith award, the most prestigious literary award in the country was instituted by the Bharatiya Jnanpith, a cultural institute devoted to oriental research. The award is given to the best creative literary writing of a specified period by an Indian citizen in any of the country's 15 recognised languages. It was first awarded in 1965.

Following is the list of previous awardees: 1965 Mahakavi Sankara Kurup: *Odaanuzhal*; 1966 Tara Shankar Banerji: *Manadevata*; 1967 Dr. K. V. Puttappa: *Ramayana Darsanam*; Uma Shankar Joshi: *Prishiti*; 1968 Sumithranandan Pant: *Chidambara*; 1969 Firak Ghorakhpuri: *Gulab-gama*; 1970 Dr. V. Satyanarayana: *Ramayana alapavrikshana*; 1971 Bishnu Dey: *Smithi uttha Bhavisvath*; 1972 Ramdhari Singh: *Urvashi*; 1973 D. R. Bhehdhre: *Prakuthanthi*; Gopinath Mohanti: *Madimadal*; 1974 V. S. Khandekhar: *Yayathi*; 1975 P. V. Kilandam: *Chitrappavai*; 1976 Ashapurna Devi: *Pradhama Prathi Shruti*; 1977 Dr. K. Govaram Karanth: *Mukajia Kanakasugala*; 1978 S. H. Valsyayan: *Kitni Navom Mehnibar*; 1979 B. K. Battacharya: *Mrutun-ya*; 1980 S. K. Pottekkat: *Oru Desathinte atha*; 1981 Amrita Pritam: *Kagaz ke Kan-vas*; 1982 Mahadevi Verma: *Yama*; 1983 Dr. Kasthu Venkateswara Iyenkar: *Chikkaveera Rajendra*.

New Jnanpith Award: The Bharatiya Jnanpith has instituted another literary award — "the Moortidevi Sahitya Puraskar". Kannada novelist C. K. Nagaraja Rao won the award last year for his novel *Pattamahadevi Shantana*. The award that carries a cash prize of Rs. 1,000 will be given every year for a literary work in an Indian language or English for highlighting the importance of the eternal values cherished in Indian life.

Republic Day Honours: Dr. C. N. Ramachandra Rao, Director, Indian Institute of Science, Bangalore and Prof. M. G. K. Menon, Member, Planning Commission, were awarded the *Padma Vibhushan* in 1985.

Bharat Ratna, the nation's highest award, was not given to anyone for the second consecutive year.

Twentyone eminent personalities were awarded *Padma Bhushan* and 44 the *Padma*...

Pulitzer for Bhopal Story

The newspaper Newsday of Long Island, New York won the Overseas Press Club of America's top award for its coverage of India during the Bhopal disaster, the assassination of Indira Gandhi and violence among Sikhs.

Earlier Newsday won two Pulitzer prizes, including international reporting for articles on the plight of the hungry in Africa.

Mr. Jeffrey Sommer, (31) won the Hal Boyle award for the best daily newspaper for wire service reporting from abroad. Mr. Sommer, Asian bureau chief for Newsday, is based in Beijing.

Runner-up citations for best coverage from abroad were given to Associated Press reporter Brahma Chellaney for articles on the Golden Temple and to correspondents Tyler Marshall, Bob Sector and Rone Tempest of the Los Angeles Times for their coverage of the assassination of Mrs. Gandhi.

Each award carries with it a \$1,000 prize that will be presented at a May 20 luncheon at Columbia University, which administers the awards.

(AP: April 26, 1985)

Outstanding musician Bhimsen Joshi, noted scientist Dr. S. Varadarajan, Director of CSIR, Mr. S. S. Gill, Secretary, Information and Broadcasting Ministry, and Prof. Gurbaksh Singh, Vice-Chancellor of Delhi University are among the *Padma Bhushan* awardees.

The *Padma Shri* award winners include Punjabi folksinger Asa Singh Mastana, Olympic athlete P. T. Usha, film stars Smita Patil and Naseeruddin Shah, painter Elizabeth Brunner of New Delhi, artist Laxman Pai of Goa, Bharat Earth Movers Chairman Maj. Gen. Som Nath Bhaskar, medieval history research professor Syed Hasan Askari of Bihar and Surgeon Dr. Samiran Nandi of New Delhi.

Sahitya Akademi Award: The Sahitya Akademi selected 22 books for its 1985 award. The awards include a casket

containing an inscribed copper plaque and a cheque for Rs. 10,000.

The following are the winners:

Assamese: (Late) Krishnakanta Handigue: Krishna Kanta Sandikoi Rachana—Sambhar (Literary Criticism);

Bengali: Sunil Gangopadhyay: Sei Samay (Part II Novel);

Dogri: Dinoo Bhai Pant: Ayodhya (Drama);

English: Kamala Das : Collected Poems (Poetry);

Gujarati: Kundanika Kapadia: Sat Paglan Aakashmen (Novel);

Hindi: Nirmal Varma: Kavve Aur Kala Pani (Short Stories);

Kannada: (Late) T. R. Subha Rao: Durgasthamana (Novel);

Kashmiri: Mirza Arif: Loli Vetsar (Poetry);

Konkani: J. B. Moraes: Bhitorem Tufan (Poetry);

Maithili: (Late) Hari Mohan Jha: Jeevan Yatra (Autobiography);

Malayalam: Sukumar Azhicode: Tatvamasi (Critical Study);

Manipuri: H. Guno Singh: Vir Tikendrajit Road (Novel);

Marathi: Vishram Bedekar: Ek Zad Ani Don Pakshi (Autobiography);

Nepali: Machendra Pradhan: Nil Kanth (Novel);

Oriya: Rajendra K. Panda: Saila Kalpa (Poetry);

Punjabi: Ajit Cour: Khana Badosh (Autobiography);

Rajasthani: Sanwar Daiya: Ek Duniya Mhari (Short Stories);

Sanskrit: Vasant T. Sevade: Vindhyaivasini Vijaya Mahakavyam (Epic);

Sindhi: Arjun Hasid: Mero Sij (Poetry);

Tamil: A. S. Gnanasambandan: Kambar: Putiya Parvai (Literary Criticism);

Telugu: (Late) P. Padmaraju: Gaalivana (Short Stories);

Urdu: Balraj Komal: Parindon Bhara Asmann (Poetry).

Sangeet Natak Awards: The 1984 Sangeet Natak Akademi Awards were won by the following artistes:

Music: Sharafat Hussain Khan (Hindustani vocal), Kishen Maharaj (Hindustani instrumental — Tabla), Maharajapuram Santhanam (Carnatic vocal), N. Ramani (Carnatic instrumental — flute), Balakrishna Das (Odissi music), Surinder Kaur (Punjabi folk music), S.

Sarada (Bharatanatyam).

Dance: Sudharani Raghupati (Bharatanatyam), Durga Lal (Kathak), Singhajit Singh (creative and experimental dance).

Drama: Vasant Kanetkar (playwriting — Marathi), Uttara Baokar (Acting—Hindi), Rajaram Bhau Kadam (Marathi folk theatre — Gondhal) Gulab Bai (Nautanki).

The award consists of Rs. 10,000 and a *tamrapatra*.

National Film Awards: Hindi Feature Film 'Damul', produced and directed by Prakash Jha won the National Award for the best film for 1984. The winner gets the Swarna Kamal and Rs. 50,000 as Producer, and a Swarna Kamal and Rs. 25,000 as Director for "boldness in confronting and exposing highly volatile contemporary injustices in a competent, honest moving film."

Adoor Gopalakrishnan won the award for the best Director for his film, 'Mukhamukham'.

Dada Sahib Phalke Award: The country's highest award in the field of films: Satyajit Ray. This carries a Swarna Kamel and a cash prize of Rs. 1 lakh and a Shawl.

Indira Gandhi Award for best first film of the Director: Pratap Pothen for the Tamil film 'Meendum Oru Kadhal Kathai'.

Best Actor: Naseeruddin Shah, for the film 'Paar'.

Best Actress: Shabana Azmi, for the film 'Paar'.

Best Supporting Actor: Victor Banerjee, for the Bengali film 'Ghaire Bhaire'.

Best Supporting Actress: Rohini Hattangadi, for the Hindi film 'Paar'.

Best Film of Aesthetic Excellence and Social Relevance Providing Popular and Wholesome Entertainment: 'Kony' (Bengali). Director: Sreejit Dhe.

Nargis Dutt Award for Best Feature Film for National Intergration: Admi Aurath (Hindi). Director: Tapan Sinha.

Best Feature Film for Family Welfare: Mohan Josh's 'Haazir Ho' (Hindi). Director: Saeed Akhtar Mirza.

Best Children's Film: 'My Dear Kutichathan' (Malayalam). Director: Jijo.

Best Film on Prohibition: 'Accident' (Kannada). Director: Shankar Nag.

Best Screen Play: Adoor Gopalakrishnan (Mukhamukham).

Best Cinematography: 'Jehangir Choud-

ry's 'Poly'.

Best Child Artiste: Master Aravind, Master Uresh, Master Mukesh and Baby Sonia ('My Dear Kuttichathan').

Audiography: P. Devadas ('Mukhamukham').

Editing: Anil Malnad (Kannada 'Sitaara').

Art Direction: Nachiket and Jayoo Patwarhan ('Utsav').

Music Direction: Jaidev ('Ankahee').

Lyric: Vasant Deo ('Saaransh').

Playback (male): Bhimsen Joshi ('Ankahee').

Playback (female): S. Janaki ('Sitaara').

Costume designer: Harudas and Bapuldas Ghahre Bhaire').

The best feature films in regional languages are:

Kannada: 'Bandhana', produced by Rohini Pictures and directed by S. V. Rajendran.

Malayalam: 'Mukhamukham', produced by Ravindranathan Nair and directed by Adoor Gopalakrishnan.

Tamil: 'Achimillai Achamillai', produced by Rajan Balachander and V. Natarajan and directed by K. Balachander.

Telugu: 'Sitaara', produced by Edida Jageswara Rao and directed by Vamsy.

Hindi: 'Paar', produced by Swapan Sarkar and directed by Goutam Ghose.

Assamese: 'Son Moina', Bengali: 'Ghaire', Marathi: 'Mahananda', Oriya: 'Klanta', Khasi: 'Manik Raitong'.

The Hindi film 'Giddh' got the special jury award with a Rajat Kamal and Rs. 5,000.

The best short film awards: 'Music of Atyaji Ray' (directed by Utpalendu Chakraborty for National Films Development Corporation), 'Bada Madiya' (anthropological), Padmasree Kalamandalam Krishnan Nair (biographical), 'Aranya Aamar' (environmental), 'Krishi Jantrapati' (industrial), the Indo-Soviet 'Nehru' (historical reconstruction), 'Sweekar and Geeli Meeti' (social welfare) and 'Everest' (adventure).

Film Festival Awards: In the 10th International Film Festival of India concluded in New Delhi on January 17, 1985, the highest honour — Golden Peacock for Best Feature Film was shared by two feature films "*The Ruthless Romance*" from the U.S.S.R. and "*The Bostonians*" from U.S.

Other awards: Silver Peacock for Best

Actor: Brazilian actor Carlos Vereza, hero of "*Memories of Prison*".

Silver Peacock for Best Actress: British actress Vanessa Redgrave and the debutante American actress Madeleine Potter share the award for their performance in "*The Bostonians*".

Silver Peacock for Best Direction: Japanese director Sadao Nakajima for his film "*Appassionata*".

Silver Peacock the Best Documentary Director: Moeshedul Islam, a young director from Bangladesh.

Golden Peacock for Best Short Film of the Festival: Veteran Canadian director Norman McLaren's "*Narcissus*".

Spécial Prize of the Jury: Hungarian film "*Passing Fancy*", directed by Gyula Maar.

Gallantry Awards: The Ashok Chakra, one of the highest honours for gallantry was won by five army officers and men — four of them posthumously.

The awardees: Capt. Jasbir Singh Raina (Guards) is one of the recipients. Four posthumous awardees are: Maj. Bhukant Misra (Kumaon Regiment), Lt. Ram Prakash Roperia (Madras Regiment), Naik Nirbhay Singh (Kumaon Regiment) and Naik Bhawani Datt Joshi (Garhwal Rifles).

Param Vishist Seva Medal was won by 24 serving and retired senior officers of the Army, Navy and Air Force for gallantry and distinguished service. The other awards are the Kirthi Chakra, Ati Vishisht Seva Medal, Shaurya Chakra, Sena/Nao Sena/Vayu Sena Medal and Vishisht Seva Medal.

Nursing Awards: Seven Nurses, one woman health visitor and an auxiliary nurse midwife won the national awards for meritorious service for 1984.

The awardees are:

Mrs. Rukmani Bakkappa, Nursing Sister, Railway Headquarters Hospital, Ayanavar-am, Madras, Sister Elizabeth Edattukaran, Principal, Rapsbun School of Nursing, Nazareth Hospital, Shillong, Mrs. Anandini M Bage, Vice-Principal, College of Nursing, Rajendra Medical College and Hospital, Ranchi, Mr. Raman Tejpari Goswami, Nursing Tutor, Government Hospital, Rajkot, Mrs. T. Saraswathy Nair, Senior Sister Tutor, Hamidia Hospital, Bhopal, Mrs. K. K. Das, Senior Matron, Kasturba Hospital, BHEL, Bhopal and

Mrs. Urmil Gupta Assistant Nursing Superintendent, ESI Hospital, New Delhi.

Mrs. Mamoo Subba, Health Visitor, District Hospital, Singtam, East Sikkim, Mrs. Surekha Prabhakar Bhandari, Auxiliary Nursing Midwife, Marwad, Jalgaon district, Maharashtra.

Right Livelihood Award: The Indian civil rights activist, Mr. Rajni Kothari won \$94,000 (Rs.11.28 lakh) Right Livelihood Award, also known as the alternative Nobel prize, at the Swedish Parliament in December 1985. Mr. Kothari is a member of 'Lokayan', an organisation concerned with civil rights and environmental protection. The other winners of the annual award are researchers Mr. Gary Fowler from the US and Mr. Pat A. Mooney of Canada and the Hungarian environmentalist, Mr. Janos Vergha. The first two among the three got it for research on the impoverishment of genetic germ plasm in plants and its dangers to crops.

Arjuna Awards: Four athletes—P.T. Usha, Shiny Abraham, Suresh Yadav and Raj Kumar are among the Arjuna Award winners for excellence in sport.

Among the winners are 19 sportsmen and women for the year 1983 and 15 for the year 1984.

The awardees are:

Athletics: P.T. Usha and Suresh Yadav (1983). Shiny Abraham and Raj Kumar (1984).

Ball badminton: D. Rajaraman (84).

Billiards: Subash Agarwal (83).

Basketball: Suman Sharma and Radhev Shyam (83)

Boxing: Jaspal Pradhan (83)

Chess: Dibyen du Barua (83) and Pravin Thipsav (84)

Cricket (men): Ravi Shastri (84). Cricket (Women): Diana Edulji (83)

Cycling: Armin Rohinton Arethana (83).

Equestrian: Capt Ghulan Mohd Khan (84)

Football (Women): Shanti Malik (83).

Hockey (Men): Zafar Iqbal (83) Hockey (Women): Rajbir Kaur (84).

Kabaddi: Maya Kashinath (83)

Kho-kho: Venna Narayan Parab (83) and S. Prakash (84)

Polo: Lt. Col. R.S. Sodhi (83)

Power-lifting: P.J. Joseph (84)

Rowing: Maj Praveen Kumar Uberoy (83) and Capt Mohd Amin Naik (84).

Snooker: Om B. Agarwal (84).

Shooting: S.H. Mohinder Lal (83).

Swimming: Anita Sood (83) and Khajan Singh (84).

Volleyball: R.K. Purohit (83) and Salv Joseph (84).

Weightlifting: Vispy K. Daroga (83).

Mountaineering: Col B.K. Khullar and Bechendri Pal (84).

R.D. Birla Award: The Rs.5 lakh Rameshwar Das Birla Smarak Kosh triennial international award for 1984-85 has gone to Dr. Robert Gallo, Chief of Tumor Cell Biology Laboratory at the National Cancer Institute at Bethesda in Maryland (USA).

The jury, headed by Mr. Justice P.N. Bhagwati of the Supreme Court selected Dr. Gallo for the coveted award for his success in isolating a new type C retrovirus (HTLV) and characterising this virus and examining the role it plays in human T-Cell leukemia.

The R.D. Birla Award of Rs.1 lakh for 'Outstanding Research in Medical and Related Fields by an Indian working in India' was won by Dr. M.S. Valiathan, Director of Sri Chitra Institute for Medical Sciences and Technology, Trivandrum.

Bajaj Award: The Jamna Lal Bajaj Award for 1985 for the contribution to the field of constructive work was won by T.S. Avnashalingam, Coimbatore.

Sanjay Roy of Rajasthan won the Bajaj Award for Application of Sciences and Technology for Rural Development.

Jankadevi Bajaj Award for contribution to the 'Welfare and Uplift of Women and Children' was won by Mrs. Anutai Wagh of Maharashtra.

Borlaug Award: The Borlaug Award instituted by Coromandel Fertiliser Ltd. was won by Dr. Krishan Lal Chadha, Director of Indian Institute of Horticultural Research, Bangalore. The award named after Nobel Laureate Dr. Norman Borlaugh was instituted in 1972.

Nehru Literacy Award: The Nehru literacy award for 1984 has been awarded to Mr. Mushtaq Ahmed for his pioneering work in the field of adult literacy for nearly four decades. Ahmed is the 17th recipient of the Nehru award instituted by the Indian Adult Education Association.

Other Awards: Shantiswarup Bhatnagar Award for 1985: Prof. R. Narasimha

Director, National Aeronautical Laboratory, Bangalore.

Jawaharlal Nehru National Award for Sciences: M.G.K. Menon, Member, Planning Commission.

Lata Mangeskar Puraskar: Naushad Ali (65), Music composer.

B.C. Roy Award: Indira Gandhi (posthumous); Dr. Satish Dhawan, Chairman, Indian Space Research Organisation; Dr. B.K. Anand, Director, Sher-I-Kashmir, Institute of Medical Sciences, Srinagar; Dr. K.S. Sangeev, former Professor of Madras Medical College, Madras; Dr. C.L. Javeri, Gynaecologist, Bombay.

Goenka Award for Excellence in Journalism: Rajkumar Keswani, Bhopal, on the basis of reports forewarning Bhopal Gas tragedy.

Vayalar Rama Varma Literary Award

(**Malayalam**): M.T. Vasudevan Nair for his book 'Randamoozham'.

Indira Gandhi Award: The Indira Gandhi National Award of Rs. 100000 instituted by the Madhya Pradesh Government was given to Rajmohini Devi, 85, for her work for the tribals in Chhattisgarh.

Sanjay Award: Eminent botanist T.N. Khoshoo and Kalpakkam Reactor Research Centre Director C.V. Sundaram are among the four persons selected for the Sanjay Gandhi awards for science and technology for 1984 and 1985. Award carries Rs. 1 lakh.

Dr. Khoshoo receives the award in the discipline of environment and ecology and Mr. Sundaram in that of energy.

The award for family planning and population control is shared by noted reproductive biologist N.R. Moudgal and Dr. B.N. Saxena.

79. DISASTERS

1985 was an year of cataclysmic disasters. Nature's fury was let loose in Colombia and Mexico where thousands died of volcanic eruption and earthquakes. The year also witnessed half a dozen air disasters which took a toll of nearly 2000 lives.

In Colombia, South America, a long-time dormant volcano *Nevado del Ruiz* erupted on November 13, killing around 20,000 people.

The volcano erupted near Manizales, about 160 Km north-west of Bogota, Colombia's capital. The 5000 metre high volcano situated about 25 Km east of Manizales, poured down rock and ash over several towns over a wide area.

The hardest hit town was Armero about 50 km away, which was virtually covered up.

Town Disappeared: "Armero has disappeared from the map," radioed an airplane pilot who flew over the area.

Other towns hit by volcanic debris were identified as Murillo, Casabianca and Libano. Authorities declared the region a disaster area.

The volcano, which last erupted in 1845 had begun throwing out smoke, ashes and gas in October 1984.

It erupted with its arenas crater spewing out ashes and rocks several hundred metres in the air. Debris rumbled down the slopes

as rivers burst their banks after the volcano's ice cap melted. Several roads were cut as bridges were washed away, including a major highway between Manizales and Bogota.

A total of 21,559 people are dead or missing, according to a reported Government casualty count. Some 1,436 survivors were injured, 4,407 houses destroyed and another 19,815 were damaged. A total of 20,354 were dead or missing in the town of Armero, and 1,090 in the town of Chinchina.

Earlier, the Red Cross estimated that at least 17,000 people were dead, 2,500 injured and 50,000 homeless.

World's Worst: The Colombian tragedy is reminiscent of two other instances that involved heavy casualties. The eruption of Krakatoa in Indonesia in 1883 resulted in the loss of some 36,000 lives and in 1902 Mount Pelee levelled the Martinique island in the Caribbean, killing some 40,000 persons. With an estimated 450 volcanoes in the world—Asia and South-West Pacific accounting for a large number followed by

the Alpine-Himalayan belt, North America and South America—some 200,000 people are said to have perished in the past 500 years in tragedies of this sort.

While the scientific community is pondering over the sudden burst of the Colombian volcano, there has been shocking revelation that the clear signals that Nevado del Ruiz had been giving last year were dismissed as normal phenomenon. For that matter, scientific predictions of the ensuing calamity also has to go a long way to become precise. For instance, the scientists predicted in 1975 that *Mount St. Helens* in the U.S. would erupt within the century but it did so within 5 years of the forecast.

Countries like Japan have developed engineering skills to construct structures that could withstand even severe tremors. But, in the case of volcanic eruptions, little could be done to prevent large-scale loss of life and property because lava and ash would engulf a whole city or town within no time.

Mexican Quake: Powerful earthquakes that ravaged Mexico City on September 19, 20 resulted in the death of about 5000 people. Richter scale measurement of the quake of 8.1 put the tremor one of the worst in history.

The quake rumbling in from the Pacific Ocean struck Mexico City at 7.19 a.m. rocking the densely-populated metropolis of 18 million people for three minutes—as it cut across to the east coast.

Entire streets of buildings, including glassclad tower blocks, "danced" up and down and collapsed. Within minutes the quake cut fissures across the streets and levelled hundreds of buildings, from schools to cathedrals. Fires broke out, roads and railways were torn up and communications between Mexico and the outside world were cut for nearly a day.

The U.S. Geological Survey in Colorado put the epicentre in the ocean 400 km southwest of Mexico City. The quake cut an 800,000 sq. km swathe of destruction across the country. It was felt in Houston, Texas, 1,200 km north and in Guatemala City 1,000 km south from the Mexican capital.

Second Quake: Closely on the heels of the first one a second major quake hit the City the next night. Registering 7.3 on the

open-ended Richter scale, the quake, which struck at 7.37 p.m. occurred 400 km southwest of the city, in the same general area as the earlier tremor. More buildings collapsed in the city area, where 250 buildings were reduced to a rubble in the first quake.

The new quake, lasting 90 interminable seconds, brought back death and suffering to the ravaged streets, and sending thousands flocking in panic from the tottering buildings as images of the previous day's nightmare returned. At last five more buildings of three or more storeys had collapsed. In others, fresh cracks disfigured the facades. It became apparent that many buildings which survived in the first quake did not manage it the second time.

The new quake temporarily halted rescue attempts to reach victims of the first quake. Some 50,000 rescuers, digging through mountains of debris, pulled out 2000 bodies. An estimated 5000 people were injured. The quakes destroyed about 250 large buildings. Another 1,000 were damaged and 50 more were declared structurally unsafe.

Scientists say that the eruption of the Colombian volcano, like the earth-quake of Mexico, had its roots deep in the shifting plates of Earth that characterises the Pacific Ocean, the edges of which are known as the "Ring of Fire".

Plate Motion: The layers of the Earth's crust in the Pacific basin are constantly in motion, rolling, shifting over, under or by each other at a speed of 1 to 8 inches an year, according to the Geologists. When there is a sudden rupture along the edge of a plate, the earth-quake results. At some juncture the rock is brought far enough beneath the surface to melt. When the expansion pressure of resulting gases and molten material reaches high enough pressure, a volcano eruption results.

A Soviet specialist, Nikolai Medvedev says that the Mexican quakes as well as the frequent tremors along the Eurasian mountain-ridges from the Alps to the Himalayas are the results of the drift of the heavy nucleus and the magnetic access of the Planet.

Worst Quakes: The massive earth-quake measuring 8.1 on the Richter Scale which shook Mexico on Sept. 19 may join the

Bloodiest Air Year That Was

Is it safe to travel by air? This question was uppermost in the minds of jet-set travellers all over the world in 1985, which saw nearly 2000 people dead in airline disasters.

The numbers are frightening: 329 deaths in the June 23 crash of an Air India plane off Ireland, 133 lives lost when a thunderstorm caught a Delta airliner at Dallas on August 2, 520 people perished when a Japan Air Lines jet went down northwest of Tokyo on August 12, and a DC-8 crashed after takeoff from Gander, New Foundland, Canada, killing 258 people on Dec. 13.

Add to that the 54 people who suffocated or burned to death inside a British Airtours charter jet on August 22 after an aborted takeoff from Manchester, England, and the total is 1,294 airline fatalities in various parts of the world over a two-month period.

Take the overall statistics, including 148 dead in the crash of an Iberia Boeing 727 at Bilbao, three consecutive air accidents in Colombia and half a dozen other disasters around the world and add the sixty people killed in the world's bloodiest hijacking of Egyptian airliner to Malta at November end, the figure reaches 2000.

The death toll for accidents involving commercial carriers could well be higher, since accidents that occur in the Soviet Union and other East European nations are not reported in the Montreal-based

International Civil Aviation Organisation (ICAO).

Not counting the Soviet bloc, the world this year has witnessed six times the number of airline deaths experienced in 1984.

If 1985 has proven itself an extraordinary bad year for commercial air travel, then 1984 was an unusually good one.

ICAO's 152 member-states reported only 224 air deaths for all of 1984, or 0.02 deaths per 100 million passenger kilometres. The best figure before that was 0.04 deaths per 100 million flight kilometres in 1981, when ICAO registered 354 air fatalities.

International air transport has seen a huge rise in passenger volume over the past decade, from 534 million counted by ICAO in 1975 to 835 million in 1984. In terms of passenger kilometres the increase is even more dramatic—from 697 billion in 1975 to 1.268 trillion in 1985.

Barry Coleman, a leading underwriter at Lloyd's of London, predicts that the more than 600 million dollars in insurance premiums paid by the world's airlines for 1985 will not come anywhere close to covering financial damages from crashes that year.

Other London-based insurers reckon with successful personal claims of up to 170 million dollars in the Japan Airlines disaster alone, plus 35 million dollars for the Boeing Jumbo that was destroyed in the crash.

worst such catastrophes of this century, after those that shook San Francisco, California in 1906, northern Peru in 1970 and Nicaragua in 1972.

It was the second major earthquake to hit Mexico in 12 years.

Following are the world's worst earthquakes since 1970.

● May 31, 1970, a 7.7 degree earthquake

killed 60,000 people in Peru.

● December 23, 1972, between 6,000 and 12,000 dead and 20,000 unaccounted for in Nicaragua after an 8-degree quake in the country's capital Managua.

● May 11, 1974, 20,000 dead in southwest China in a 7-degree quake.

● February 4, 1974, 23,000 dead in a 7.3 degree quake in Guatemala.

Charles Richter Knew...

Charles F. Richter, whose name immediately evokes unhappy thoughts about earthquakes was once asked where one should go to escape the risk of such calamities. He simply said "nowhere" and added: "Every area has its own risk. So the only alternative is to go somewhere else and accept some other risk." Mr. Richter, who died in California on Oct 7, 1985 was aware of the massive earthquakes in Mexico city, decimating thousands of people on September 19 and 20. "One of the nurses told me that she had been watching television and listening to the Richter ranking of the earthquake," he said a fortnight back in a Pasadena hospital, battling a heart disease.

How are earthquakes caused? When the state of strain or distortion of a limited portion of the earth is suddenly changed, elastic waves are set up which travel outward in all directions. The shaking of the ground produced by the wave is an earthquake. Primary waves cause any rock in their path to compress and then expand in the same direction as the waves are travelling; secondary waves move the rocks in a direction perpendicular to their path. The 85-year-old seismologist's device called the Richter scale is used all over the world to gauge the energy released by these terrestrial convulsions. Earthquakes up to six on this scale are mild ones, causing no serious damage. Those between six and eight can be disastrous, especially in a thickly populated area. Beyond eight the earthquakes are cataclysmic and wreak total destruction.

● July 26 1976 700,000 to 800,000 dead in the Beijing region, according to Chinese sources, in a quake reaching 7.3 to 8.2 degrees

● November 24 1976, 3,000 dead in Turkey after a 7.6 degree quake

● August 19, 1977, 190 dead in Indonesia, 7.7 degrees.

● November 23, 1980, three 7 degree quakes killed 2,800 people in southern Italy.

● May 26, 1983, the strongest quake in Japan in 44 years, 7.7 degrees, killed 101 people.

● March 3, 1985, a 7 to 9 degree quake killed 177 people in Chile.

● August 24, 1985, a 7.4 degree quake killed 60 people in China.

(AFP, Sept. 20, 1985)

JAL Crash: The worst airline disaster of the year was that of a Japanese JAL Boeing 747 crash in Central Japan on August 12, 1985, killing 520 persons.

The JAL Boeing 747 flying between Tokyo and Osaka crashed within half an hour of its taking off from Hanada airport, Tokyo. Noticing a crack on the cabin door, the Pilot tried to return to the airport. But the Jumbo crashed on a mountain region north-east of Tokyo, killing all except 4.

The JAL jet was on a domestic flight. However, there were 21 foreign nationals among the passengers. Of these 3 were Indians: K. Mukerjee, Mrs. T. Mukerjee and S. Chavachana.

The JAL jumbo crash is the worst in single plane disasters. The worst in airline history is the head-on collision of two jumbo jets of Panam and KLM on Tenerife in Spain's Canary Islands on March 27, 1977. It resulted in the death of 582 persons.

'Kanishka' Tragedy: Next comes Air India's Jumbo, *Kanishka* that crashed into the Atlantic on June 23, while flying from Montreal to London. The wreckage of the plane scattered over a wide area near Cork in Ireland and the bodies of most of the dead numbering 329 were recovered in a salvaging operation that took months.

The crash of Air India Jumbo, off the Irish coast was the 4th involving the Airline. On January 24, 1966, an Air India Boeing 707 crashed on Mont Blanc in France, killing 117 people including the Indian Nuclear Scientist, Dr. Homi Bhabha.

On Jan 1 1978 an Air India Boeing 747 crashed in the Arabian Sea, after taking off from Bombay, killing 213 people.

Air India Boeing 707 crashed in a rain-



storm at Bombay International Airport, on June 5, 1982, killing 17 people.

Explosion Theory: In spite of comprehensive enquiries on the cause of accident by various agencies including Justice B.N. Kripal Commission appointed by Government of India, a conclusive proof of the theories that an explosion at the behest of Sikh extremists of Canada caused the disaster has not been obtained. However, it has been established that plastic explosives caused the blast in the baggage hold of a Canadian jetliner at Tokyo Narita Airport on June 23, the day Air India Jumbo crashed into the Atlantic. Air India received Rs 116 crores from the General Insurance Company towards the loss of "Kamishka". It was in the look-out to buy another big aircraft to replace the lost one. It was reported that Air India would pay \$75000 as compensation to each of the victims of the crash. Relatives are also reported to have initiated court actions to get the compensation enhanced.

In the light of complaints world wide, the

Boeing Company of U.S. has decided to make structural modifications on Jumbo jets. More than 600 jumbo jets are in service around the world.

The third of the worst air disasters was that of a British Airtours charter jet which exploded in Manchester airport, killing 54 persons on board.

The Boeing 737 was taking off to the island of Corfu in Greece with 131 holiday passengers and a crew of 6. While still on the run-way, an engine on the left caught fire and exploded. Many passengers jumped to safety. But the majority was caught up in flames and smoke.

18 Ships Missing: With the missing of Indian Ships *Nitya Nanak* and *Nitya Ram* in June/July 1985, the number of ships lost similarly since 1980 have risen to 18.

Panamanian bulk carrier *Arctic Carrier* also figures among the latest missing ones mentioned in the *Lloyd's list*, a prestigious shipping journal.

Bhopal's First Anniversary

The first anniversary of Bhopal Gas Tragedy, the world's worst industrial disaster that caused the death of over 2500 people was observed on 3rd December 1985. The tragedy that caused distress, misery and privation to more than 2 lakh people was the result of toxic leak from the Union Carbide Pesticides Plant in the heart of heavily populated Bhopal City.

Even after an year, the wounds and scars resulting from the disaster both in physical and psychological terms are still not healed despite great efforts by the Governmental and non-governmental agencies. Men, materials and funds have been pressed into service to provide succour to the hapless in a massive way. But it is evident that these efforts come nowhere near the magnitude of the need. Till December 1985 Rs. 45 crores has been spent in relief and rehabilitation.

Even though Scientists and Medical experts thought it was the Methyl Isocyanate that caused the tragedy, a new theory

that gas was none other than the more deadly Hydrogen Cyanide has been advanced lately. While this issue continues unsettled, the Union Carbide Corporation of USA has propounded a theory of sabotage or vandalism at Bhopal.

On the orders of the State Government the Pesticides factory was closed on July 11, 1985. The first anniversary saw the workers thrown out of job conducting a dharna inside the factory. Union Carbide India Ltd. announced that it will pay the retrenched workers numbering 627 Rs.1.07 crore as compensation.

Warren Anderson, the head of the Union Carbide Corporation, USA, has expressed the hope of reaching an out-of-court-settlement with the Indian Government on claims from the Bhopal tragedy.

The tearful homage paid to the victims of the disaster by the people of Bhopal on December 3rd remains as a stark reminder of the world's worst industrial Hiroshima for many years to come.

When the *Arctic Carrier* last reported to her agents in Hong Kong, the message reported damage about the waterline caused by rough weather on June 23. Some debris, including a small oil slick and several coloured drums were spotted off the Coast of Africa but it could not be conclusively linked to the missing vessel which had left Brazil with 28 crew members for Indonesia on June 17.

The *Nitya Nanak* left Colombo for Calcutta on July 18 and lost radio contact three days later while *Nitya Ram* left Calcutta on June 21 and was last reported near Trincomalee. Both ships, owned by Maini Shipping Company, had a crew complement of 22 each. The dates when the three ships were posted missing had not yet been mentioned in the list.

The only ship of Kerala Shipping Corporation, *Kairali* disappeared in the mid-ocean around 15th July, 1979. It had a crew of 51

It is said in the 16 years upto 1975, disappearances occurred at a rate of five to ten a year. Between January, 1961 and Dec. 1971, 70 vessels were officially posted missing by the Premier Lloyd's insurance company of London.

In all, around 400,000 tonnes of shipping and nearly 400 people had vanished without trace since 1980. Suggestions for the possible causes included explosions on board, shifting loads causing ships to capsize, freak weather conditions and even piracy. The report said that speculation aside, no conclusive evidence of sinking had been found in any of the cases and the mysteries lived on.

COVER FEATURE

STAR WARS: DEATH IN THE ORBIT

PKS Namboodiri

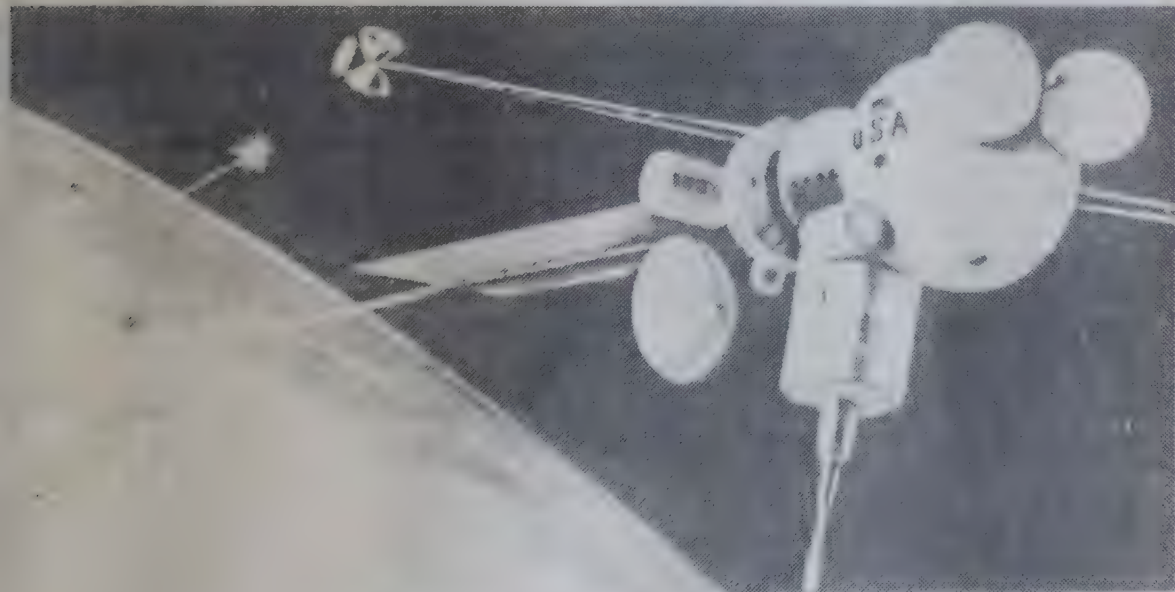
(Institute of Defence Studies
and Analyses, New Delhi)

'An Atom bomb is an absolute weapon and a nuclear war an absolute catastrophe. A thousand million people will die of direct war effects and another 2500 million as a result of starvation.'

It was on a note of great hope for the future of humanity that the last World War ended in 1945 with the crushing defeat of Fascism. That note, unfortunately, was not to be the case. Cold War clouds soon began to cast a spell of rivalry and competition in the world arena. This basic East-West antagonism has remained the truly major global preoccupation ever since. For one thing, the all-round consequences of this conflict have debilitated not only the antagonists but its vicious

affliction has not spared the rest of the world either. More important, however, is the chilling reality that in this rivalry lie the seeds of total universal destruction.

'An Atom bomb is an *absolute weapon* and a nuclear war *the ultimate catastrophe*. A thousand million people will die of direct war effects and another 2,500 million as a result of starvation. Caught in a global ecological catastrophe, 'nuclear winter' effects, the rest of mankind would also perish along with



Mock-up of a 'killer satellite'

several other species of higher forms of life. Even a small fraction of the 50,000 nuclear weapons now in stock, with an explosive potential of one and a half million Hiroshima bombs, can cause the extinction of man on planet Earth.

Ground Rules. The superpowers, the United States and the Soviet Union, who own more than 90 per cent of this destructive power, know this. They have, therefore, worked out certain ground rules to avoid a nuclear war, to limit their arms race in certain areas and to conduct their strategic competition according to mutually agreed principles. Thus, they have agreed in the past not to place nuclear weapons in space, not to conduct nuclear explosions in any other medium than underground, not to attack each other's satellites and not to build systems intended to destroy the adversary's nuclear missiles.

The idea of all these was to maintain a certain nuclear *balance of terror* between the superpowers under the theory of deterrence. Deterrence is said to operate, as in the case of current US-USSR nuclear balance, when both sides have a definite capability to absorb a *pre-emptive* or *first strike* by the opponent and is still in a position to *retaliate* so massively that both sides desist from starting a nuclear war. Conversely, a major breakthrough in weapon technology can unsettle this balance and whoever gains an edge over the other might be tempted to strike first in the hope of disarming the adversary and in the process unleash a nuclear holocaust.

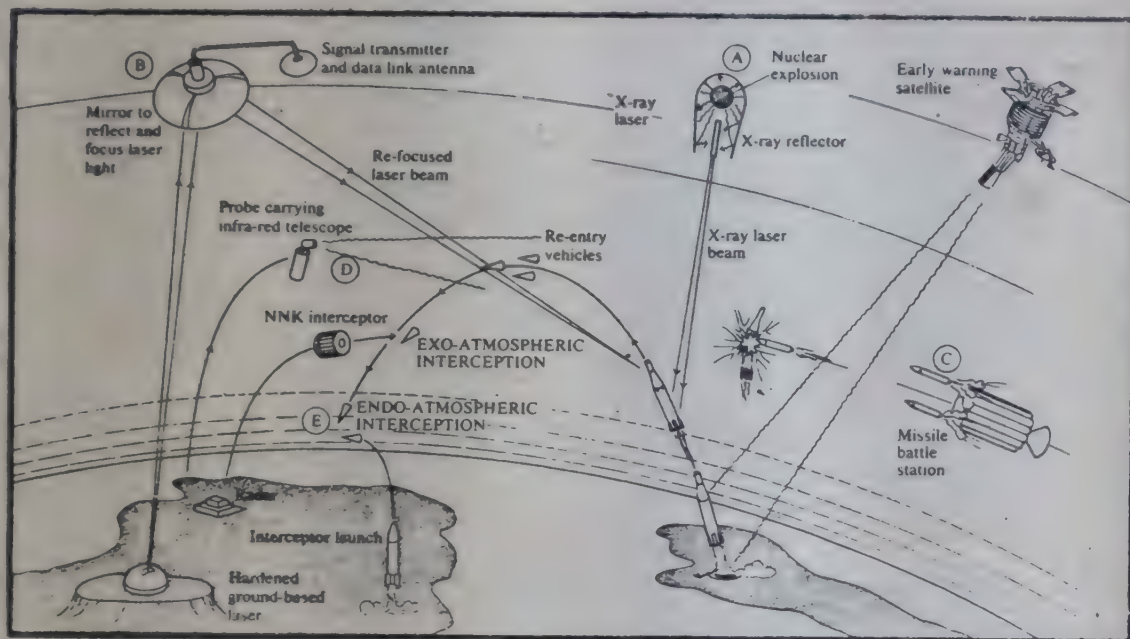
How it came about. From the foregoing discussion it becomes clear that vigorous, unilateral pursuit of nuclear war systems and strategies might lead to unpredictable consequences. The nuclear competition between the superpowers can be conducted only within an arms control framework in which both sides agree on basic issues. Outside such a framework it becomes a free-for-all affair; and in nuclear matters such a situation is simply unimaginable.

Viewed against this background, the new dimension of the nuclear arms race signified by the *star wars* programme of the United States (officially called the *Strategic Defence*

Initiative or SDI), has no parallel in history. It is more potent than even the first two major landmarks in nuclear arms build up—the first atomic test by the United States in 1945 and the Soviet conquest of outer space for the first time in 1957. It is unprecedented in many ways. For the first time (except the brief, later abandoned anti-ballistic missile, ABM, effort of the 1960s), missile defences are contemplated, thus opening a new avenue for competitive arms build-up. A whole panoply of latest technologies is being sought to underpin this effort. For the first time also the potential of the vast outer space is planned to be exploited in full measure.

This new era in nuclear arms competition was inaugurated by the US President Ronald Reagan in an address to the nation on March 23, 1983 when he called upon the American scientists to come forward with plans to erect a missile shield or ballistic missile defence (BMD) against Soviet nuclear attacks. Nicknamed *star wars* by the American media, the programme is intended to make nuclear weapons "impotent and obsolete" in the words of the US President. The plan as it evolved since has identified several key technology areas and has committed an expenditure of about \$26,000 million over five years to "provide the evidentiary basis" for a decision later whether and how such a system could be developed and deployed. This is expected by early 1990s and till then it would continue basically as a research programme.

Multi-layered. In the 'star wars' scheme, a multi-layered defence is envisaged. The first space-defence layer plays the main role in the system i.e. the boost phase interception. The Soviet ICBMs (intercontinental ballistic missiles) would be knocked out as they rise from their silos, at an altitude upto 500 km. and while they are still over Soviet territory and prior to the deployment of their re-entry vehicles carrying warheads. In this layer the destruction of the Soviet missiles would be caused by the use of directed energy weapons like chemical and X-ray lasers and particle beam weapons. These systems have to be installed on hundreds of space platforms fitted out with an optical focussing system or a mirror, and a laser or particle beam pointing device. Bulk of the ICBMs would be destroyed within 2 to



Essentially, three layers of defence are planned. A missile is detected by an early warning satellite and intercepted during the boost-phase either by a nuclear explosive X-ray laser (A), by a ground-based laser beam reflected off a space-based mirror launched on warning (B), or by a missile launched from a space-based battle station (C). The missiles which escape destruction release their warheads which are detected by an infra-red telescope and intercepted by non-nuclear (NNK) warheads above the atmosphere (D). Those warheads which escape this interception are detected by ground-based radars and intercepted by conventional nuclear warheads (E), this time within the atmosphere.

5 minutes after their launching.

The second layer goes into action against the surviving ICBMs and warheads when they are in their mid-course phase. This layer consists of electromagnetic rail guns, which can fire projectiles at several dozen kilometers per second, and also satellites with compact homing missiles. Several hundred satellites in near-earth orbit with 40 to 50 interceptor missiles are envisaged to knock out targets in the boost and mid-course phases. In the third and terminal phase of the flight, warheads would be intercepted individually either before they enter the atmosphere over North America or before they impact. This would be done by short and long range, land-based anti-ballistic missiles.

The boost phase is the most critical part. Scientists and experts are unanimous that for the defence to be effective, upto 90 per cent of the Soviet ICBMs must be destroyed in that phase. There are only two areas on ground from where line-of-sight interception of Soviet missiles in that phase is possible; they are in Pakistan and China. Essentially, therefore, interception has to be by means of either space-based systems or by what are known as 'pop-up' platforms. If it has to be space-based, it involves deployment of a very large number of battle stations in low orbit or, alternatively, creation of a new system that can intercept missiles from the geostationary orbit at 39,000 km altitude. For the pop-up mode, submarines are needed to fire very fast missiles which can beam X-ray

lasers from space from seafronts close to Soviet missile sites. Such seafronts are the northern part of the Arabian Sea (south of Pakistan at a latitude of about 23 degrees) and the Norwegian Sea. The Sea of Okhotsk near Japan is also a possible front.

How It Is Fought. A brief scenario of *star wars* is something on the following lines. The first important requirement is an early warning of an attack. This is done by geostationary satellites with sensors to detect the infrared emissions from rockets in boost phase. Warning would be available as the missiles rise through the lower atmosphere. The next task is to provide a threat assessment: determining the exact number of rockets, their positions and even their identities. The system could use sensors on aircraft, on satellites, or on popped-up platforms.

Target acquisition and tracking follow. Each object in the 'threat cloud' has to be distinguished and its trajectory determined by a sequence of measurements of position and velocity. The system should also be able to discriminate between real targets and decoys and other false targets in the threat cloud. Computers assigned to battle-management would use the tracking and targeting information to assign interceptors and beam weapons. Continuous tracking data are vital for homing interceptors and for aim points for beam weapons. It is estimated that the *star wars* battle-management system would have to track upto 30,000 objects employing hundreds of sensors, parallel processing at the rate of 500 million instructions per second, with a data base of over 107 bytes and 10 million lines of code.

A damage assessment will follow to determine target destruction and rectify defects, if any, in defence. Subject to time limit, there will be a second round of firing and a third and so on until time runs out. For the boost phase interception, all these tasks would have to be completed within that time when the booster separates from the missile.....three minutes. The total time available for all the three layers of interception is less than 30 minutes. At the same time, the *star wars* system itself would be under attack and must be able to defend itself on its own.

Viability. The breathtaking complexity of the *star wars* system has given rise to

serious doubts about its viability both among scientists and administrators. After an extensive study of the techniques involved, the Union of Concerned Scientists in the United States has concluded that the boost-phase interception is "extremely difficult and perhaps impossible." Without a nearly leak-proof boost-phase defence, a multi-layered system is doomed to failure. Moreover, the array of simple, effective countermeasures the Soviets could employ to thwart the interception are daunting enough. It is also said that the Soviets would be able to develop cheap countermeasures thus making the expensive *star wars* programme extremely cost-ineffective.

How much does the *star wars* cost? No detailed estimates have been made though the tentative ones vary from a few hundred billions of dollars to a couple of trillions (trillion is a million million). On the one hand, Pentagon's top scientist, Richard DeLauer believes the cost would be staggering since the programme is dependent on several key technologies each "equivalent to or greater than the *Manhattan Project*." The Manhattan Project gave the US the first nuclear weapon at a cost of around \$20 billion at today's prices. On the other hand, the noted Astrophysicist Dr. Robert Jastrow has claimed that it is possible to build a *star wars* system at a cost not more than \$200 billion. Meanwhile, about \$10 billion has been budgeted for *star wars* research during 1985-87 (Table).

Touchstone. The prospects notwithstanding, the *star wars* project has already become the touchstone of the Reaganite vision for a future America invulnerable to nuclear attacks. The U.S. Congress is, however, yet to be fully convinced. A major study commissioned by the Office of Technology Assessment of the Congress has concluded that the probability that *star wars* technologies, when further developed, will provide a perfect or near-perfect system, "is so remote that it should not serve as the basis of public expectation or national policy." The Presidential panel on strategic weapon systems, the Scowcroft Commission, has also expressed its reservations about full development of the system.

Meanwhile the *star wars* R&D is fast progressing and breakthroughs in several key technologies have been reported.

According to Lt. Gen. James Abrahamson, Director of the programme, they include electromagnetic rail gun technology, lasers and particle beam weapons, homing overlay experiments and the radar homing interceptor vehicle. However, he himself has admitted that "a perfect defence is not a realistic thing." The irony is that at today's levels of superpower deployment of about 10,000 strategic warheads on each side, even a 95 per cent kill rate would be insufficient to save either society from disintegration in the event of a general nuclear war.

Yet the present U.S. Administration seems to have become a prisoner of a scientific fantasy called *star wars* and thus fallen into the trap against which President Eisenhower had warned in 1961: "In holding scientific research and discovery in respect, as we should, we must also be alert to the equal and opposite danger that public policy could itself become the captive of a scientific-technological elite."

Countermeasures. Whether the *star wars* would eventually emerge as a viable option or not, the perception on the Soviet side that such a possibility exists, is bound to generate preparations to counter the US initiative. The United States has claimed that the Soviet Union also has invested considerably in *star wars* technologies and that once U.S. goes ahead with its plans, the USSR might also respond with its own *star wars*, thus both having an effective missile defence system. However, the Soviet Union has made it clear that it has no such plans and that if Washington went ahead with the space weapons programme against Moscow's opposition to it, it would rather respond by

strengthening its offensive forces.

The Soviet leader Mikhail Gorbachev has said that the *star wars* programme has implications which "destabilise the entire system of international relations and lead to an even greater sharpening of political and military confrontation." He also warned that if the US went ahead with the programme, "we will have no other choice than to undertake countermeasures including, of course, the strengthening and upgrading of nuclear arms."

Surely, the cheapest and perhaps the most challenging Soviet response would be a massive build-up of offensive missiles and decoys. This would mean the end of arms control treaties now in operation. A number of other passive and active countermeasures are also available with existing proven technologies.

Battle Stations. Space-based battle stations, for instance, are highly vulnerable to relatively primitive attacks by satellites. Mirrors and laser systems forming part of the *star wars* can be attacked in low orbits by releasing a swarm of one gram steel pellets in the path of a battle station. Their velocity—16 km per second—which is eight times faster than an armour-piercing anti-tank projectile, can demolish a two-centimetre thick aluminium shield covering the mirror, or one ounce steel pellet would penetrate 15 cm of steel. Space-mines, parked close to battle stations, can also be remotely detonated destroying such stations.

Countermeasures against boost phase interception can frustrate space-based and pop-up systems. A booster that burns out quickly (even within 50 seconds) is immune

'Star Wars' Budget, 1985-87 in \$ mn

	85	86	87
1 Surveillance, Acquisition, Track & Kill Assessment	546	1,386	1,875
2 Directed Energy Weapons	377	966	1,196
3 Kinetic Energy Weapons	255	860	1,238
4 Systems Concept and Battle Management	99	243	272
5 Survivability, Lethality & Key Technologies	112	258	317
6 Management Headquarters SDI	8	9	10
Total	1,397	3,722	4,908

to X-ray and particle beam weapons. The post-boost 'bus' that slowly dispenses warheads and decoys can be replaced by a device that would rapidly deploy them and this could be done without any loss of accuracy. City-destroying re-entry vehicles need no elaborate electronics and would be vastly tougher than boosters to destroy. Ordinary laser beams can penetrate into the atmosphere, but shortening of boost phase dramatically would lessen the time available for interception.

Passive measures to hinder effective targeting of boosters can also be resorted to, such as:

- Adding 'pollutants' to propellant that burns especially brightly, ejected by various booster nozzles at different times. In contrast to a conventional booster, this one would emit a flame that is both asymmetrical and varied sporadically. Such variations in infrared signal could not be predicted by the attacker. This will confuse tracking and targeting;
- So called skirts on flames using hollowed cylinders to deny accurate sighting of flames; and
- Target acquisition can also be impeded by creating a large infrared background against which it is far more difficult to find booster flares. This can be done by exploding nuclear weapons in the upper atmosphere just before the firing of the ICBMs.

The booster missiles can also be protected by the following measures:

- They can be coated with a highly reflective material, kept clean by a foil overlay during early stage of boost;
- The booster can be spun so the beam does not dwell on the same spot;
- Boosters could be equipped with heat sensors and a hydraulic system that would bring a coolant to those portions of the skin that are being bathed in a laser beam; and
- The so-called 'band-aid', a relatively short cylinder, specifically designed to absorb heat, can be made to move at the command of heat sensors to protect the booster from the attacking beams.

A good deal of *star wars* programme's efficacy is dependent on overcoming countermeasures against it. Many officials in the US Administration believe that a determined

enemy can overwhelm the defences. Others argue that even then it is advantageous to engage the Soviets in a race to exhaust them. Dr. Robert Jastrow, a leading US space physicist has asserted that to overwhelm the *star wars* scheme, the Soviet Union has to launch five times as many missiles as they now have, or 7,000 missiles, which would cost them upto \$2 trillion. In his view, the Soviets would not be able to develop a fast-burn booster for 15 to 20 years, whereas another expert, Sidney Drell, said they could do it in 10 years.

The Pentagon's former research head for strategic and space systems, Seymour Zeliberg, revealed that the Defence Department did consider the tradeoff between the costs to the Soviets of 'hardening' their missiles, on the one hand, and the cost to the US of building the lasers, on the other. Clearly the tradeoff was unfavourable to the US. The Soviets could protect their missiles with "a relatively straight forward retrofit," according to Zeliberg. He said: "Lasers notwithstanding, there is still no technological fix that is going to rescue us from the peril we share with the Soviet Union—the assuredness of our mutual destruction in a nuclear war."

Consequences. How does the *star wars* fit in with the overall strategic relationship between the superpowers? There appear to be two streams of thinking in the US. One is that both superpowers have an abiding interest in moving away from 'offensive-dominated' to a 'defence-dominated' world. The transition from here to there could be ensured through appropriate arms control arrangements. The other line of thinking regards *star wars* an instrument for the preservation of America's supremacy. The programme could be used as a point of pressure to force the Soviets to submit to arms control on US terms.

The Soviets will then have to choose between the alternatives "to suicide today and to inferiority tomorrow," and might give in to the latter. In this view, articulated by strategists like Colin Gray, the Soviet Union will easily step down to a number two position: "The nightmare scenario of a desperate Soviet Union choosing to fight today rather than live with the consequences of a measure of military inferiority tomorrow, is

thoroughly implausible, if not totally ridiculous."

Further, the transitional path from offence to defence is riddled with dangers. It could take decades, could be tricky and would be dangerous. The American arms control negotiator Paul Nitz says that both sides have to avoid a mix of offensive and defensive systems that in a crisis give one side or the other incentives to strike first. The real fear is that the side that got to the optimal mix first might reason that it could destroy most of the other side's forces in a first strike and blunt the retaliatory blow with defence. This, in theory, would make nuclear war "rationally" thinkable, for the first time.

Vulnerability. It is difficult to imagine that an invulnerable space-based defence can be built. This vulnerability, in fact, adds to its destabilisation potential. Though a perfect defence is impossible, it may create illusions about possible defence against the retaliatory second-strike and hence promote a first-strike strategy. Moreover, command, control, communication and intelligence (C³I) systems which are critical to nuclear strategy, are space-based and their vulnerability to anti-satellite weapons have been tested by both sides.

Actions even remotely resembling of hostile nature in space might, therefore, mean hostilities in outer space. This would most probably entail a rapid escalation of the armed conflict from the 'space-to-space' combat operations to 'earth-to-space', 'space-to-earth' and soon 'earth-to-earth' strikes leading to an all-out nuclear exchange. Such a conflict could even be triggered by space accidents caused by the accumulation of space-based systems in limited orbits.

In the transitional period a space defence competition might create a far more tense situation because it would be interpreted by both superpowers as vitally threatening. Fear of the military or political consequences of strategic vulnerability could lead the nation that perceives itself as disadvantaged to consider waging a nuclear war to prevent deployment of *star wars* systems. Even if the transition is carried through without the outbreak of a war, the post-*star wars* phase would be profoundly destabilising. It would increase the risk of nuclear war during US-USSR confrontations and reduce the

7 Layers Defence

The planners of a defense against nuclear missiles are leaning toward a seven-layer system that would consist of thousands of space satellites with weapons intended to furnish a nearly perfect nationwide shield.

The preferred design is more intricate and immense than previously suggested, according to a study by the Strategic Defense Initiative Organization, an arm of the US Defence Department.

The Pentagon's disclosure of the year-long study was the most data led explanation of how the United States hoped to build the missile defense envisioned by President Ronald Reagan in a speech in March 1983.

To protect 3,500 major targets in the United States, including missile fields and urban centers, the plan would employ groups of lasers and other energy-beam weapons, launchers that fire high-speed projectiles and ground-based rocket interceptors.

(New York Times: Nov. 4, 1985)

chances of controlling hostilities if war did break out.

As pointed out by the former American Defence Secretary, Harold Brown, with or without constraints on the build-up of offensive forces, defensive systems would create uncertainties as to the effectiveness of the retaliatory capabilities on each side. This could lead to pressures to pre-empt with nuclear weapons in a crisis. While it is most unlikely that either side could confidently believe that it had a first-strike, damage-limiting capability, Brown argued, any such possibility could prove "enormously destabilising."

Arms Control. The most profound impact of the possible introduction of the *star wars* in a few years from now is likely to be in the area of superpower arms control measures. In the present context, the crucial

issues are continued adherence of both superpowers to their 1972 ABM (anti-ballistic missile) Treaty and restraint on deployment of space systems, especially anti-satellite systems. All these are intimately linked to the larger question of militarisation of outer space.

The United States and the Soviet Union signed the ABM Treaty which banned future development of anti-ballistic missile systems, the basic idea of which was to limit the stimulus to piling up offensive arms by both sides that the ABM systems then threatened to bring. The treaty, therefore, stands at the very centre of the effort to limit the strategic arms race.

It became possible when the two sides recognised that the pursuit of defensive systems against nuclear weapons would inevitably lead to an expanded arms competition and to greater insecurity for both. In its underlying meaning, the treaty is a safeguard less against defence as such than against unbridled arms competition. The continuing and excessive competition that still persists in offensive weapons would have been even worse without the ABM treaty. It remains the only ratified and active strategic arms limitation agreement between the superpowers.

Under the Treaty, both the US and the USSR have undertaken not to "develop, test or deploy" anti-missile systems or components which are sea-based, air-based, space-based or mobile land-based. It, however, does not forbid them from conducting research. The United States maintains that its *star wars* programme does not violate the provisions of the ABM treaty, although it insists that testing is also part of the research. The Soviets have not accepted this position and they have expressed growing concern about ABM violations by the US pursuit of the *star wars* scheme. So there is still this thin margin on which hangs the fate of this Treaty. Its collapse, even in spirit, might prove to be a big blow to arms control efforts.

Another serious development in the *star wars* context is the growing anti-satellite

(ASAT) capability. Since satellites are a critical component of the nuclear war plans of both superpowers, both the Soviet Union and the United States have in recent years stepped up their efforts to develop a viable anti-satellite weapon system. In the *star wars* context, the ASAT question assumes significantly ominous dimensions. These arise from the basic fact that *star wars* systems can also play an ASAT role and that ASAT capability will become critical to counter the *star wars* strategy once it materialises. This close connection between advanced missile defence concepts and future ASAT systems springs from the following factors:

- *ASAT attack on space-based weapons and sensors is probably the most attractive countermeasure to boost-phase interception;*
- *Directed energy weapons are more likely to succeed in the easier mission of ASAT than in the more difficult mission of boost-phase interception;*
- *Early stages of BMD development might be conducted in the guise of ASAT development, giving rise to anxieties about the health of the ABM Treaty regime; and*
- *An ASAT agreement would impede star wars research in the early stages than would occur under the terms of the ABM Treaty alone.*

Thus the ABM Treaty, the ASAT issue and the *star wars* have all been caught together in an intricate web of strategic and technological inter-relationship that it has become impossible to separate them. As McGeorge Bundy put it, the complex interface between missiles defence and anti-satellite capabilities is such that those who believe in the limitation of the arms race should strenuously insist on restraint in the development of all forms of space weapons. The land and the seas on the planet have already been militarised and even nuclearised. So is the medium of air above it. Now the fourth dimension, the outer space, is under threat. Will man take his destructive weapons to the 'final frontiers'? We may know in a few years from now.

Part Three

*India
and
States*

80. THE GREAT CIVILISATION

India derived its name from the river Indus, which flowed through north-west India—now north-west India and Pakistan. The first Aryan settlers in India called the river Indus, the Sindhu, meaning a huge sheet of water.

The Indus is a mighty river. With its five tributaries draining the Western Himalayas from Kailas to Kashmir, the Indus carries an annual flow, twice that of the Nile and three times that of the twin giants, Euphrates and Tigris combined. The Aryans in their long trek through Iran into India could never before have encountered a river of such magnitude as the Indus. That was probably why they called it the Sindhu.

In 518 B.C. Darius, the Persian Emperor, conquered the country around the Indus and converted it into a Persian satrapy. The Persians, who found it difficult to pronounce an initial 'S', turned *Sindhu* into *Hindu*. Passing through the hands of the Greeks, *Hindu* became *Indus*. India was the country of the *Indus*. With the Muslim invasions, the old Persian name returned in the form of *Hindustan* and the people who inhabited the land, came to be called *Hindus*.

Indus Civilization. The name 'India' thus harks back to the ancient Indus civilization, though no one had heard of such a civilization till the 1920s. However, in the latter half of the twenties, two ancient sites in the Indus Valley—*Harappa* and *Mohenjo-daro*—were excavated. These cities brought to light a civilization, which was at first called the Indus Valley Civilization or for short, the Indus Civilization but was specifically described later as the Harappan Civilization.

The discovery of this civilization posed a historical puzzle. It had appeared on the stage of history, full grown and fully equipped, like Athene from the head of Zeus and just as suddenly. All civilizations known to history have started from small beginnings and have taken hundreds of years to reach their prime. The Harappan civilization showed no signs of such birth and growth.

This puzzle was solved only recently with the discoveries at *Mehrgarh*, Baluchistan, in 1973-80. The settlements at Mehrgarh, in the western valley of the Indus, were built more than 3,000 years before Mohenjo-daro and Harappa, which are situated in the eastern Indus valley. According to two researchers of Mehrgarh, *Jean Francoise Jarrige* and *Richard H. Meadow*, Mehrgarh provides an archaeological record with a long sequence of occupations.

The sequence reveals a process of continuing elaboration that affected cereal cultivation, animal husbandry, crafts, architecture and even ideology. Step by step, one can see the stage being set for the development of the complex cultural patterns that became manifest in the great cities of the Indus civilization in the middle of the third millennium BC. The cities here referred to are *Mohenjo-daro* and *Harrappa* in Pakistan and *Kalibangan*, *Lothal*, *Sukortada* and other cities in India.

Mehrgarh lies alongside the Bolan river at the foot of the Bolan pass. The Bolan and Khyber passes are famous in Indian history as the earliest known mountain passes through which hordes of people have crossed into India from Central Asia. "Here, the Kachi plain, a large expanse of nearly flat alluvial outwash slopes generally southeastward for more than 200 km to the Indus river." Research in this part has shown the existence of farming settlements belonging to that early Neolithic period, when pottery was still unknown. The most recent of a succession of mud brick structures has been shown by carbon 14 analysis to date back to the 6th millennium BC.

The settlement consisted of multi-room rectangular mud brick units separated from

one another by open spaces that held numerous human skeletons—obviously burial grounds. Some of the structures were divided into small square compartments, apparently used for storage. Among the artifacts left are grinding stones and small flint blades. The presence of cereal grains in the mud debris indicated that two varieties of barley and three varieties of wheat were cultivated during this period. Plants other than cereals included jujuba plants and date palms.

Indications are also available for the domestication of cattle, goats, sheep and water buffaloes. The water buffalo seems to have been a speciality of the Indus valley, since they are not traceable in western Asia (Middle East) around this time. Among the artifacts found buried with the dead are bead necklaces, anklets and belts. Beads were made from shell, bone, various local stones and imported turquoise and lapis lazuli. The most intriguing discovery is a single cylindrical copper bead. Does it mean that copper was first discovered by the Indus people?

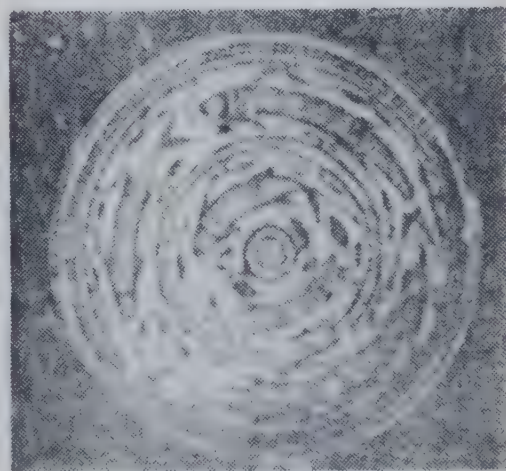
Copper Rings. By the fifth millennium BC, Indus Valley had entered the *chalcolithic age*. Implements of flint no doubt dominated but metal had come into use, though it was scarce. Only one copper ring and one copper bead have been uncovered at Mehrgarh during this period. Agriculture prospered embracing several new varieties of barley and wheat.

A new entrant into the agricultural economy was cotton. Although it is not clear whether cotton was cultivated for its seeds or fibre, its cultivation is another unique feature of the Indus civilization. Cattle dominated animal husbandry. They were bred mainly for meat and probably also for milk. Their use as draught animals, however, is doubtful. Bead making continued, soap-stone providing plenty of raw material for the purpose. Pottery advanced to red painted ware but production seems to have been limited. The commonest forms were pear shaped jars with outward curving rims.

The 4th millennium was an age of innovation and industrial expansion. Pottery was wheel thrown and mass produced. "Crafts became more specialised and a network of long distance contacts brought to Mehrgarh

turquoise from Iran or central Asia, lapis lazuli from northern Afghanistan and shells from the coast of the Arabian sea"* Beads of turquoise, carnelian and lapis lazuli were worked with the aid of green jasper bits which were rotated by means of bow drills.

"This evidence", say Jarrige and Meadow, "for the early use of the potter's wheel and the bow drill marks Mehrgarh as a centre of technical innovation, more than 1000 years before the beginning of more elaborate craft to both east and west. We also uncovered fragments of several crucibles that had been used to melt copper. Traces of the metal still adhered to them"†



Pottery—Shallow bowl, grayware
Mehrgarh—4th millennium BC

Painted Wares. Mass produced pottery formed two major groups. There were plain wares in a variety of shapes and thickness, including egg-shell-thin goblets and painted wares displaying geometric decorations, including intricate polychrome patterns (see Fig.). Production of male and female figurines continued but statuanes of this period depicted humans in a sitting posture instead of the earlier standing posture. Materials used for figurines were also used for making stamp seals.

By 3000 BC viticulture or vine cultivation had started in the Indus valley. Pottery had advanced to such lengths that the most

* Jarrige & Meadow

† Ibid.

rigorous standards were maintained even in large scale production.

The third millennium was a period of great expansion (of settlements) in the Indus valley. Apparently, population was pressing heavily on land and new colonies had to be founded in far off places. In the western valley, settlements radiated from Mehrgarh to eastern Iran and southern Turkmenistan on one side and to south Baluchistan on the other. In the eastern valley cities like Mohenjo-daro, Harappa, Kalibangan, Lothal and Sukortada were founded.

By the middle of the third millennium Indus civilization had established itself on both sides of the Indus. Many houses were two-storeyed and contained a large number of rooms. Pottery had become so refined that some of them ranked as works of art. The technique of firing had become efficient enough to attain temperatures capable of vitrifying the materials fired. (This technique is being followed even today in the areas around Mehrgarh). Statuaries also improved.

The figurines are again seen in a standing posture but they are much more naturalistic than before. Animal figures made of terracotta include representations of the humped bovine, the *zebu*, of wild pigs and various birds. A unique find is the figure of a ram carved in alabaster. Stamp seals also carried figures of animals and other intricate designs. One bears the stylised figure of a running zebu bull. (see Figure)

Harappan Civilization. The Harappan period belongs to the bronze age at its best and represents the high watermark of the Indus civilization. This age had at first been set between 2500 and 1500 BC. But carbon 14 analysis of materials from Kalibangan, Lothal, Sukortada and Mohenjo-daro showed that its age lasted only for 700 years—from 2400 to 1700 BC—instead of a whole millennium. Apart from the fact that Carbon 14 dating is not all that infallible, it has to be remembered that there are areas both at Mohenjo-daro and Harappa which remain to be investigated and that materials from these areas have not been subjected to carbon 14 analysis. Therefore, it is quite possible that the conventional dates 2500 to 1500 BC assigned for the Harappan period may turn out to be valid after all.

The Harappan civilization which covered

all cities in the eastern valley of the Indus was spread over a huge area. Prof B.B. Lal estimates that the total area measured 1600 km east to west and 1100 km north to south.† This is much greater than the area jointly occupied by the contemporary civilizations of Egypt and Sumeria.



Stamp seal with stylised zebu bull Mehrgarh
— 4th millennium .BC

Town Planning is a modern concept. It is therefore surprising that the Indus people should have practised it more than 5000 years ago. "The first thing", says Prof. Lal, "that strikes a visitor to an Indus site—be it Harappa or Mohenjo-daro in Pakistan or Kalibangan, Lothal or Sukortada in India†—is the town planning. One finds the streets and lanes laid out according to a set plan; the main streets running from north to south and the cross-streets and lanes running at right angles to them. At Kalibangan, among the north-south streets, there was a principal one 7.20 metres wide, while the other north-south streets were three-quarters of its width. "The cross streets and lanes were once again half or quarter of the width of the narrower streets from north to south. Such typical and

‡ A Cultural History of India-Ed. A.L. Basham.

† Mohenjo-daro, meaning 'Mound of the Dead' is in Larkana in Sind. Harappa is in Montgomery District in Punjab. Both are in Pakistan. Kalibangan is on the left bank of the now dry river Ghaggar in Rajasthan. Lothal is near the Bhogavo river, not far from the Gulf of Cambay in Gujarat. Sukortada is about 270 km northwest of Ahmedabad, also in Gujarat. The last three cities are in India.

minutely planned residential areas often called the 'lower towns' were themselves only a part of the entire settlement complex"•

Both at Mohenjo-daro and Harappa, houses were made of kiln-burnt bricks. "Such bricks are rare in contemporary Mesopotamia or Egypt"*. An average house consisted of a courtyard around which were situated four to six living rooms, besides a bathroom and a kitchen. "The big houses have two or more storeys and are furnished with paved floors and courtyards, doors, windows and narrow stairways. It is specially noteworthy that almost every house has wells, drains and bathrooms"*** Sullage water was discharged through well covered street drains made of kiln-burnt brick. At intervals they were provided with manholes for clearance.

The Citadel at Mohenjo-daro contained many imposing buildings all made of kiln-burnt bricks: for example, the great bath, the college, the granary and the assembly hall. The Great Bath is 180 ft long and 108 ft. wide and its outer walls are about 8 ft. thick. The solidity of the construction is amply borne out by the fact that it has successfully withstood the ravages of 5000 years".

Harappa gives us some idea of the workers. "Enclosed by a boundary wall, of which only odd bits are now to be seen, the workmen's quarters stood in two rows, running from east to west. Each dwelling covering an area of about 17 by 7 metres comprised two rooms and was entered through an oblique passage, evidently so arranged for privacy. The remarkable uniformity of these quarters reminds one of modern barracks and all that they imply."†

Kalibangan, Sukortada and Lothal show more or less the same planning and structural patterns. Lothal, however, was a port unlike Kalibangan and Sukortada. It has a dockyard 216 metres in length and 37 metres in width. The dockyard was lined with a wall 1.2 metres thick of kiln-burnt bricks now seen rising to a maximum height of 4.3 metres. The tell-tale remains show that Lothal must have been a very busy port.

New Decor. Indus pottery continued to maintain the high reputation it had earned at Mehrgarh. But patterns had changed. Familiar scenes of every day life replaced the old geometrical patterns and animal decorations. In one case, there is a she-goat suckling a kid, while a hen loiters nearby. In another, a man carries on his left shoulder an equipoise with two large nets—apparently a fisherman.

Terra cotta figurines of humans and animals have now become fascinatingly naturalistic. So also are stone sculptures like the steatite figure of a bearded priest and the bronze image of a dancing girl both found at Mohenjo-daro.

But the most important legacy of the Indus valley is the seals. Cut out of steatite, the seals of the Harappan period are usually 20 to 30 millimetres square. (see Figures). On the obverse is an inscription, generally accompanied by an animal figure and on the reverse, a perforated knob evidently for suspension.

The script seemingly pictographic and having nearly 400 signs has not yet been deciphered

The Mastery of Numbers is attested to by the system of weights and measures. Made usually of chert and cubical in shape, the weights fall in the progression of 1, 2, 8/3, 8, 16, 32 etc. upto 12,800. The scales of ivory or shell indicate a 'foot' of about 13.0 to 13.2 inches and a 'cubit' of 20.3 to 20.8 inches" (B.B. Lal).



Steatite Stamp seals
Kalibangan—3rd millennium BC

The Indus civilization was firmly based on a prosperous agricultural economy. This shows that the Indus region must have had plentiful rains during the period. "Today it is news if Mohenjo-daro gets even 10 cm of rain

• A Cultural History of India.

• Ibid.

*** Advanced History of India. R.C. Majumdar.

† Advanced History of India. R.C. Majumdar.

during the whole year. Moreover, dry channels occurring close to the (Indus) sites show that in ancient times the Indus, Ravi Ghaggar (Saraswati of the Vedas), Satlej and Bhogavo flowed respectively on the outskirts of Mohenjo-daro, Harappa, Kalibangan, Ropar and Lothal" (Lal). Thus there was adequate water supply, which coupled with a rich alluvial soil, produced diverse crops—wheat, barley, bananas, water melons, peas and cotton.

The Harappans appear to have used a two-piece dress—a dhoti and a shawl—which is the same sort of dress that an Indian rustic wears today. The women dressed their hair in different styles and decked themselves with a variety of ornaments. "The *bija*, a hollow conical object, is typical even today of the maids of Rajasthan" (Lal).

Religion. Although little is known of the religious beliefs or practices of the Harappans, many practices of modern Hindus look like a throwback to Indus culture. The portrayal on several seals of a three-faced figure, surrounded by various animals is reminiscent of Siva as *Pashupati*, Lord of Animals. The *lingam* and the *yoni* (male and

female genitals) which figure in later Hinduism apparently go back to Indus Valley. Worship of Sakti (Mother Goddess) and of trees and streams as gods or the abodes of gods also seem to have come down from the Indus days.

That the Indus Valley had extensive foreign trade both by land and sea is shown by the presence of West Asian articles like animal-headed pins or mace heads in India and the corresponding presence of Indus goods in West Asian sites such as Ur, Susa, Umma, Lagesh and Tell Asmar.

The Indus script still remains undeciphered—*pace* Dr S.R. Rao and the Soviet experts (see Box *Indus Script*). As it is, we know very little of the organisation or the administration of the Indus cities. Nevertheless, it may be assumed that the Indus Civilization was primarily a cultural and commercial empire, rather than a political organisation. The coming of the Aryans changed the entire picture. Kings and princes appeared on the scene. Empires came and went. The history of India assumed political overtones, which have survived to the present day.

81. NATIONAL INSIGNIA

The State Emblem of India is an adaptation from the Sarnath Lion Capital of Asoka as preserved in the Sarnath Museum. The Government adopted the emblem on 26 January, 1950, the day when India became a Republic.

In the original of Sarnath Capital, there are four lions, standing back to back, mounted on an abacus with a frieze carrying sculptures in high relief of an elephant, a galloping horse, a bull and a lion separated by intervening wheels (*chakras*) over a bell-shaped lotus. Carved out of a single block of polished sandstone, the Capital is crowned by the Wheel of the Law (*Dharma Chakra*).

In the State Emblem adopted by the Government only three lions are visible, the fourth being hidden from view. The wheel appears in relief in the centre of the abacus with a bull on the right and a horse on the left and the outlines of the other wheels on the extreme right and left. The bell-shaped lotus has been omitted. The words, *Satyameva jayate* from the *Mundaka Upanishad* meaning 'Truth alone triumphs', are inscribed

below the abacus in Devanagari script.

National Flag. The National Flag is a horizontal tri-colour of deep saffron (*Kesari*) at the top, white in the middle and dark green at the bottom in equal proportion. The ratio of the width of the flag to its length is two to three. In the centre of the white band is a wheel, in navy blue, which represents the *Charkha*.[§] Its design is that of the wheel (*Chakra*) which appears on the abacus of the Sarnath Lion Capital of Asoka. Its diameter approximates to the width of the white band. It has 24 spokes.

The design of the National Flag was adopted by the Constituent Assembly of India on 22 July, 1947. Its use and display are regulated by a code.

[§] Khadi Spinning Wheel

National Anthem: Rabindranath Tagore's song *Jana-gana-mana* was adopted by the Constituent Assembly as the National Anthem of India on 24 Jan. 1950. The first stanza (out of 5 stanzas) of the song forms the National Anthem. It reads:

*Jana-gana-mana-adhinayaka jaya he
Bharata-bhagya-vidhata
Punjab-Sindhu-Gujarata-Maratha-
Dravida-Utkala-Banga
Vindhya-Himachala-Yamuna-Ganga
Uchchhala-Jaladhi-taranga
Tava subha name jage,
Tava subha asisa mage,
Gathe tava jaya-gatha,
Jana-gana-mangala-dayaka jaya he
Bharata-bhagya-vidhata
Jaya he, jaya he, jaya he,
Jaya jaya jaya jaya he.*

The following is Tagore's English rendering of the stanza:

Thou art the ruler of the minds of all people,
Dispenser of India's destiny.
Thy name rouses the hearts of the Punjab,
Sind, Gujarat and Maratha,
Of the Dravid and Orissa and Bengal.
It echoes in the hills of the Vindhyas and
Himalayas, mingles in the music of the
Jamuna and Ganges and is chanted by the
waves of the Indian Sea.

They pray for thy blessings and sing thy
praise.

The saving of all people waits in thy hand,
Thou dispenser of India's destiny,
Victory, victory, victory to thee.

National Calendar: At the time of independence, the Govt. of India followed the Gregorian calendar based on the Christian era. At the same time, a number of indigenous eras and calendars were prevalent in India, though none of them comman-

ded all-India currency. Among them the most important were the Vikram era, the Saka era, the Bengali era and the Kollam or Malabar era. The Vikram era was the oldest, 57 years in advance of the Christian era while the Saka era was 78 years behind. The Bengali era trailed far behind at 593 years and the Kollam era was even farther behind at 824 years.

The National Government adopted the recommendation of the Calendar Reform Committee that the Saka era be adopted as the basis of the National Calendar. The Saka year has the normal 365 days and begins with Chaitra as its first month. The days of the Saka calendar have a permanent correspondence with the dates of the Gregorian Calendar, Chaitra 1 falling on March 22 in a normal year and March 21 in a Leap Year. The National Calendar commenced on Chaitra 1 Saka, 1879 corresponding to March 22, 1957 AD.

The months of the National Calendar, with their days and the dates of the Gregorian Calendar corresponding to the first day of the Saka month are given below:

Saka & Gregorian Calenders*

1 Chaitra 30/31 days**	March 22/21**
1 Vaishaka 31	April 21
1 Jyaishta 31	May 22
1 Asadha 31	June 22
1 Sravana 31	July 23
1 Bhadra 31	Aug. 23
1 Asvina 30	Sept. 23
1 Kartika 30	Oct. 23
1 Agrhayana 30	Nov. 22
1 Pausa 30	Dec. 22
1 Magha 30	Jan. 21
1 Phalguna 30	Feb. 20

* As in 1982

** Leap Year

Source: Indian Astronomical Ephemeris, 1982.

82. LANDMARKS OF HISTORY

First wave of Aryan immigration into India began in 1500 B.C. They settled in the Punjab. Composition of the *Rig Veda* was the high watermark of the Vedic Age.

B.C. 1000: Aryans expand into the valley of the Ganga: Composition of the *Brahmanas*.
900: Mahabharata War. **800:** Aryans penetrate into Bengal: Composition of the

Mahabharata: First version of *Ramayana*: Beginning of the Epic Age. **550:** Composition of the *Upanishads*.

Jainism & Buddhism: 544 (?): Traditional

Date of Buddha's Nirvana. 527 (?): Accession of Darius I in Persia. 518: Darius sends Scylax on a naval expedition down the Indus: Persian conquest of north west India: Formation of a Persian Satrapy in India. 500: Aryans in the South and Ceylon. 326: Alexander invades India. 323: Death of Alexander.

Mauryan Period: 321: Chandragupta unseats the Nanda dynasty in Pataliputra and founds the Maurya dynasty. Kautilya, the Chief Minister of Chandragupta, writes *Arthashastra* (Science of Government). 272-232: Reign of Asoka. 185: Pushyamitra, the Mauryan General overthrows the last Mauryan Emperor Brihadratha and founds the Sanga dynasty.

Chola Empire. 145: Chola king Erata conquers Ceylon. Kharavela builds up an empire in Kalinga. 58: Epoch of the Krita-Malava-Vikrama era. 30: Satavahana dynasty in the Deccan. Pandyan Empire in the far South. 26: A Pandyan king sends an embassy to Rome. Chera kings in Kerala.

A.D. 40: The Sakas or Scythians in power in the Indus Valley and western India. 52: Parthian King Gondopharnes in North West India. St. Thomas begins preaching in India. 78: Saka Era begins. 98-117: Kanishka, the Scythian King. 320: Chandragupta I establishes the Gupta dynasty—Gupta Era begins. 360: Samudra Gupta conquers the whole of northern India and much of the Deccan.

380-413: Chandragupta Vikramaditya—The Golden Age of the Gupta—Literary Renaissance—Kalidasa and other poets. Renewal of Hinduism. 606: Accession of Harsha Vardhana. 609: Rise of the Chalukyas. 622: Era of the Hejira begins. 711: Invasion of Sind by Muhammad Bin Kassim. 753: Rise of the Rashtrakuta Empire. 892: Rise of the Eastern Chalukyas. 985: The Chola Dynasty—Rajaraja the Great.

1026: Sack of Somnath by Mahmud of Ghazni. 1191: Prithvi Raj Chauhan, King of Delhi, routs Muhammad Gori—the first battle of Tarain. 1192: Muhammad Gori defeats Prithvi Raj—second battle of Tarain. 1206: Qutbuddin Aybek establishes the Slave dynasty at Delhi. 1221: Mongol invasion under Genghis Khan. 1232: Foundation of the Qutub Minar.

Marco Polo visits India. 1298; 1290: Jalaludin Firuz Khilji establishes the Khilji dynasty at Delhi. 1320: Ghiyasuddin

Neo-Colonialism?

One of our standing complaints about British rule in India was the Arms Act, which applied only to Indians. Its terms were so stringent as to be strangulatory. We have roundly condemned the Act as anti-Indian and anti-national.

The Arms Act continued in all its stringency even after freedom. On June 22, 1983 the terms of the Act were made even more stringent by an Ordinance promulgated by the President. Now nobody complains. Perhaps, it is because, as Byron tells us, "Our masters now are still at least our countrymen."

Tughluk founds the Tughluk dynasty at Delhi. 1333: Ibn Batutah arrives in India. 1336: Foundation of Vijayanagar (Deccan). 1398: Timur invades India. 1424: Rise of the Bahmani dynasty (Deccan). 1451: The Lodi dynasty—Bahlul Lodi ascends the throne of Delhi. 1489: Adil Shah dynasty at Bijapur. 1490: Nizam Shahi dynasty at Ahmadnagar.

Vasco da Gama lands at Calicut: 1498; 1510: Portuguese capture Goa—Albuquerque Governor. 1518: Kutab Shahi dynasty at Golconda. 1526: First Battle of Panipat—Babur defeats the Lodis—Establishment of the Mughal dynasty. 1530: Humayun succeeds Babur. 1538: Death of Guru Nanak. 1539: Sher Shah defeats Humayun and becomes emperor of Delhi. 1555: Humayun recovers the Delhi throne from Eslam Shah, successor of Sher Shah.

1556: Death of Humayun—Accession of Akbar. Akbar defeats Hemu at the second battle of Panipat. 1564: Akbar abolishes 'jiziya' or poll tax on Hindus. 1565: Battle of Talikota—An alliance of Muslim rulers in Deccan defeats and destroys Vijayanagar Empire. 1571: Foundation of Fatehpur Sikri by Akbar. 1576: Battle of Haldighat. Akbar defeats Rana Pratap Singh of Mewar.

1582: Akbar proclaims *Din Ilahi* or Divine Faith—an attempt at synthesising Hinduism and Islam. 1597: Akbar completes his conquests. Death of Rana Pratap.

English East India Company. 1600; 1602: Netherlands East India Company.

1605: Death of Akbar and the accession of Jehangir. 1609: The Dutch open a factory at Pulicat. 1611: The English establish a factory at Masulipatam. 1627: Death of Jehangir—Accession of Shah Jehan—Birth of Shivaji.

The Tajmahal. 1631: Death of Shah Jehan's wife Mumtaz Mahal—The building of the Taj Mahal. 1639: Foundation of Fort St. George at Madras by the English. 1658: Aurangzeb becomes emperor of Delhi. 1664: Shivaji assumes royal title. 1679: Aurangzeb re-imposes Jiziya. 1707: Death of Aurangzeb. 1720: Accession of Baji Rao Peshwa at Poona.

1739: Nadir Shah of Persia conquers Delhi. 1742: Mahratas invade Bengal—Dupleix, French Governor of Pondicherry. 1748: First Anglo-French war. 1757: Battle of Plassey—The English defeat Siraja Daulah—Mir Jafar, Nawab of Bengal. 1760: Battle of Wandiwash—The English defeat the French. 1761: Third Battle of Panipat—Ahmed Shah Abdali, the ruler of Afghanistan, defeats the Mahratas—Mahrata imperialism checked.

1764: Battle of Buxar—the English defeat Mir Kasim. 1765: The English get Diwani Rights in Bengal, Bihar and Orissa—Clive, Governor in Bengal. 1766: The English secure Northern Circars in the Carnatic.

1767-69: First Mysore war—the British conclude a humiliating peace with Hydel Ali of Mysore. 1772: Warren Hastings, Governor of Bengal. 1773: The Regulating Act passed by the British Parliament. 1775-82: First Anglo-Mahrata war. The Treaty of Salbai. 1780-84: The Second Mysore War. The English defeat Hyder Ali. 1784: Pitt's India Act.

1790-92: Third Mysore War between the English and Tipu—An indecisive war concluded by the Treaty of Seringapatam. 1793: Permanent Settlement of Bengal. 1798: Marquess of Wellesley becomes Governor General of India. 1799: Fourth Mysore War—The English defeat Tipu—Death of Tipu—Partition of Mysore. 1801: The English annex the Carnatic. 1803-5: Second Anglo-Mahrata War. British under Sir Arthur Wellesley inflict a crushing defeat on the Mahratas at Assaye. 1817-19: Mahratas finally crushed by British forces. 1828: Lord William Bentick becomes Governor General—Era of social reforms—Prohibition of Sati (1829). Suppression of Thugs (1837).

Rise of the Sikhs under Ranjit Singh: 1881; 1845-46: First Anglo-Sikh War—Defeat of the Sikhs. 1848: Lord Dalhousie becomes Governor General. 1848-49: Second Anglo-Sikh War—Sikhs defeated in battle (1848). The British annex Punjab.

First Indian Railway opened from Bombay to Thana: 1853; 1857-58: First War of Indian Independence. 1858: British Crown takes over the Indian Government—Queen Victoria's Proclamation. 1861: Indian Councils Act—Indian High Courts Act—Indian Penal Code. 1868: Railway opened from Ambala to Delhi. 1877: Delhi Durbar—The Queen of England proclaimed Empress of India.

1878: Vernacular Press Act. 1881: Factory Act—Rendition of Mysore—Mysore State restored to its original ruler.

Congress. 1885: First meeting of the Indian National Congress, 1892: Indian Councils Act to regulate Indian administration. 1899: Lord Curzon becomes Governor General and Viceroy. 1905: First Partition of Bengal. 1906: Formation of the Muslim League. 1908: Newspapers Act. 1909: Minto-Morley Reforms. 1911: King George V and Queen Mary hold a Durbar in Delhi. Partition of Bengal modified to create the Presidency of Bengal. The imperial capital shifted from Calcutta to Delhi.

The First World War begins: 1914; 1915: Defence of India Act. 1918: World War ends. 1919: Rowlatt Act intended to perpetuate the extraordinary powers enjoyed by the Government during the war provokes country-wide protests. The Massacre at Jalianwallabagh. Ali brothers and Maulana Abul Kalam Azad start the Khilafat movement (for restoring the Turkish Khalifate) with Gandhiji's support. Perfect Hindu-Muslim accord. Montague-Chelmsford Reforms offer limited provincial autonomy to Indians.

1920: Congress okays non-cooperation movement. Students leave colleges, lawyers leave practice. Bonfire of British clothes, etc. to show popular dissatisfaction with the reforms. 1921: Moplah (Muslim) rebellion in Malabar. Visit of the Prince of Wales. Nation-wide hartal. Census of India.

Gandhiji. 1922: Civil Disobedience Movement. Congress makes Gandhiji sole leader of Bardoli satyagraha. Outburst of violence at Chauri Chaura. Gandhiji sus-

pends movement on this account.

1923: Swarajya party started by C. R. Das and Motilal Nehru. Swarajists propose to enter the Councils and wreck the government from within. Khilafat movement fizzles out as Kemal Pasha declares Turkey a secular state. Hindu-Muslim riots. 1925: Death of C. R. Das. 1926: Lord Reading expounds to the Nizam what paramountcy implies. Royal Commission on Agriculture. Factories Act. 1927: Indian Navy Act. Simon Commission appointed. 1928: Simon Commission comes to India. Boycott by all parties. All Parties' Conference. Muslim leaders leave the Conference.

Lord Irwin, Viceroy of India, promises Dominion Status for India. Lahore Session of the Congress asks for independence. On the midnight of Dec. 31, Pandit Jawaharlal Nehru, President of the Congress, hoists the National Flag at Lahore.

1930: Jan. 26 observed as Independence Day all over India. Civil Disobedience Movement continues. Gandhiji goes walking to Dandi—Salt Satyagraha. Repression let loose by the government. First Round Table Conference.

1931: Gandhi-Irwin Pact. Second Round Table Conference. Census of India. 1932: Suppression of Congress movement. Third Round Table Conference. The Communal Award. Poona Pact. 1933: White Paper on Indian reforms. 1934: Civil Disobedience Movement called off. 1935: Government of India Act.

1936: Death of King George V. Accession and abdication of Edward VIII, Accession of George VI. 1937: Inauguration of Provincial Autonomy. Congress Ministries formed in a majority of the provinces.

Second World War begins: 1938. Also Resignation of Congress Ministries.

Political deadlock in India. 1941: Japan enters the war. Attack on Pearl Harbour.

1942: Singapore falls to Japan. Japan occupies Rangoon. The British evacuate Burma. Cripps Mission to India. Both Congress and Muslim League refuse Cripps offer. Congress adopts Quit India Resolution (Aug. 8). Congress leaders arrested and Congress declared an illegal body (Aug. 9). Subhash Chandra Bose (Netaji) forms the Indian National Army in Malaya, with the help of the Japanese. He inaugurates Government of Free India at Singapore.

1943: Lord Wavell Viceroy and Governor General of India. Wavell's proposals for a settlement fall through as the Congress and the Muslim League could not agree. 1945: The Indian National Army under Bose surrenders to the British after collapse of Japan. National Army personnel tried for treason in India.

1946: Demonetisation of currency notes of the value of Rs. 500 and above (Jan. 12). Demonstrations against the trial of the INA men. The ratings of the Royal Indian Navy rise in open mutiny (Feb. 18). Cabinet Mission in India (Aug. 19). Cabinet Mission announces its plan for an interim government and a constituent assembly. The interim government is to be formed by reconstituting Viceroy's Executive Council. Both Congress and the Muslim League reject the proposal. Later the Congress accepts it. So the interim government is formed by inducting Congress nominees only. The Muslim League takes umbrage and starts direct action. Muslims attack Hindus in Calcutta and the rest of Bengal. Hindus retaliate. Riots break out. Viceroy persuades the Muslim League to come in. But the League declines to join the Constituent Assembly unless the demand for a separate state—Pakistan—is conceded.

83. THE NATIONAL MOVEMENT

The National Movement or the movement for independence was a part of a larger spectrum of national resurgence, which covered almost all aspects of national life, religious, social, educational, cultural and economic.

While the progress in the different spheres differed in degree and in kind from region to region, one common desire ani-

mated all regions, namely, to gain independence. How the British administration tackled this problem and how it finally ended in the

partition of India and the formation of two independent states, India and Pakistan, is too long a story to be recounted in a few pages.*

When Lord Dalhousie laid down his office in 1856 and Canning took over as Governor General the British Empire in India had extended to its natural boundaries—from Indus in the west to Irrawady (Burma) in the east and from the Himalayas in the north to Cape Comorin (Kanyakumari) in the far south. The British Indian dominion was made up of two distinct political segments—territories directly administered by the East India Company and those ruled by Indian princes who owed fealty to the company. For the first time in many years, peace seemed to have settled all over India.

But those who knew the antecedents leading to the establishment of *Pax Britannica* in India were skeptical of the apparent peace. The pacifist Lord Canning who succeeded the aggressive Lord Dalhousie as Governor General felt that the calm was ominous.

Replying to the toast at the farewell dinner given in his honour by the Directors of the East India Company in London, Canning said, "we must not forget that in the sky of India, serene as it is, a small cloud may arise, at first no bigger than a man's hand, but which growing larger and larger, may at last threaten to burst and overwhelm us with ruin". Never was prophecy more quickly fulfilled or so grimly. In the summer of 1857 the massed clouds burst and the entire British dominion in India shook to its foundations.

Revolt of 1857. This was the revolt of 1857, which the British historians have dubbed the *Sepoy Mutiny* and the Indian historians, the *First War of Independence*. True, it began as a mutiny of Indian soldiers against their British commanders. But it soon changed its character and became a fight against British rule as such.

Indian soldiers had broken out in open mutiny against British officers many times previously—in 1806 at Vellore (Madras), in 1842 in Bengal, in 1844 in Sind, then in Bihar and Punjab. None of these had any political

overtones. But the so-called Mutiny of 1857 differed radically in this respect.

All the previous mutinies have been put down mercilessly and the suspected ring leaders were subjected to gruesome punishments, without proper investigation or trial. These helped only to feed the fires of discontent.

In the meantime, other factors were building up political bonfires in different parts in India. Lord Dalhousie's *Doctrine of Lapse*, under which no prince was allowed to adopt an heir without the previous permission of the British rulers, extinguished many princely kingdoms in India. At the same time, the British Administration also started interfering in the internal administration of Indian States. This policy further inflamed the princely and aristocratic classes in India.

The two elements—military and political—coalesced in the revolt of 1857. The Indian soldiers having massacred the British personnel, marched to Delhi in May, 1857. They proclaimed the aged Mughal Emperor Bahadur Shah II as the Emperor of India. Bahadur Shah promptly issued a proclamation urging upon the people of India—Hindus and Muslims alike—"to end the tyranny and the oppression of the infidel and treacherous English".

Despite the attempts of British writers to play down the events of 1857 as an army affair, the British Prime Minister, speaking in the House of Commons on July 27, 1857, frankly admitted that the outbreak of 1857 was not just a military mutiny but a political revolt.

Last Kick. It is not quite correct to describe the revolt of 1857 as a national revolt. For, at that time, India had not yet become a nation. The revolt itself was the last kick of a dying feudal order, led by a decadent aristocracy. "The idea of a nation and therefore of nationality was a bequest of English education".

There is little doubt that the knowledge of English acquired by Indians in every part of the country facilitated inter-communication and expedited the process of national integration. The Indian middle class, steeped in English literature and history, gorged themselves with the ideas of *liberty*, *equality* and *fraternity* which the American

* All unacknowledged quotations in the Section are from Tara Chand, *History of the Freedom Movement in India*, Vols. I-IV

War of Independence (1773–1787) and the French Revolution (1789) had glorified.

The immediate results of the 1857 revolt were three: 1. The administration of British India, until then under the control of the Board of Directors of the East India Company, was taken over by the British Government. Queen Victoria was proclaimed the Empress of India and the Governor General was designated the Viceroy and Governor General.

2. The British Indian army was re-organised. The quota of British personnel in the army was considerably enhanced and the artillery divisions were manned entirely by the British. In addition, many purely British regiments were formed. 3. The paramountcy of the British Government was proclaimed, that is to say, all ruling kings and titular princes of India were declared feudatories of the British Crown. This proclamation raised many eyebrows among Indian princes, but there was little, they could do in the matter.

After all, unlike Dalhousie's Doctrine of Lapse, this declaration was merely the *de jure* expression of an authority, already functioning *de facto*. In later years, the Nizam of Hyderabad, the biggest of the Indian princes, tried to rake up the question with Lord Reading, the Viceroy. The Nizam's protest was silenced by the cryptic reply of Reading— "Paramountcy is paramount".

The take-over of the Indian Government by the British Government did not eliminate discontent, and tiffs with the white rulers continued to disturb the peace. The indigo riots of Bengal in 1859 were the first of such troubles. They were put down but subsequent investigations showed that it was the white planters who provoked the riots and the poor Indian peasants who suffered were innocent in the matter.

Fourth Estate. With the indigo riots, the agitation for freedom acquired greater momentum. Meanwhile the spread of English education brought into being a new generation imbued with liberal ideas and willing to fight a long drawn battle with the British for independence. At the same-time, a vernacular *Fourth Estate* was slowly taking shape. Up till now, all periodicals were in English and were controlled by

Englishmen.

The English Press naturally supported British policies. So it became necessary to publish vernacular periodicals to express Indian aspirations. This resulted in the promulgation of the *Vernacular Press Act of 1878*. This was a discriminatory legislation intended to muzzle the periodicals in Indian languages. The reason advanced by Lord Lytton, the Viceroy, was that "the increasing violence of the Native press now (was) directly provocative of rebellion". The whole of India protested against the Act and appealed to the British government to repeal it. The act was at last repealed by Lord Ripon in 1882.

Lord Lytton as viceroy (1874–1880) fathered an offensive brood of laws and regulations. *The Arms Act* (which exempted Europeans) and the abolition of import duties on British goods were among the more obnoxious performances of Lytton.

Lord Ripon's viceroyalty, otherwise benign, was sullied by the infamous *Ilbert Bill*. This bill amended the Criminal Procedure Code and specified that only European judges could try European offenders for serious misdemeanors. This piece of legislation amply reflected the racial prejudices of the ruling class.

In 1883 a proposal was set afoot to remove this anomaly from the Criminal Procedure Code. The European Community in India rose as one man to oppose the change and they won. "The Bill was so modified as to give the European offenders the right of claiming even in the least cases, trial by jury, of which at least half the number should be Europeans or Americans."

Masses Roused. In 1883 the agitation over the Ilbert Bill still continued. Surendranath Banerjee was arrested for an article he wrote in the *Bengali*. Soon arrests of other persons for seditious articles followed. This accumulation of discriminatory laws, arrests and prosecutions, roused the docile masses.

"It was felt that the time had come to make a determined effort to secure a real and effective control in the management of national affairs". This could only be achieved by a country-wide organisation which would mobilise public opinion all

over India and carry the agitation to the masses.

So a series of conferences were held to evolve a national organisation. In 1853, a national conference met in Calcutta under the leadership of Surendranath Banerjee. In 1884 Banerjee undertook another tour through north India to rally various political groups together and to collect money for a national fund. Another conference was held in 1885 again in Calcutta—in which delegates from Bengal, Upper India and Bombay participated. The success of these conferences showed that a national organisation was not only feasible but also inevitable.

Some Englishmen in India felt the same way. Henry Cotton and Allen Octavian

Hume among them thought that an abiding concord between the government and the people had to be built up. Cotton wrote, "They (the educated Indians) tolerate the necessity of our government as an irrevocable necessity. They demand real, not nominal equality, a voice in the government of their own country and a career in Public service".

Hume went further. He formed the Indian National Union in 1854. The aim of the Union was "to oppose by all constitutional methods all authorities high and low here or in England, whose acts and omissions are opposed to the principles of the Government of India laid down by the British Parliament and endorsed by the British Sovereign".

84. 100-YEAR-OLD CONGRESS

Indian National Congress completed one hundred years of its existence in 1985. Founded by A.O. Hume in association with various national leaders, it has stood the test of time to emerge as one of the strongest political movements in the democratic world.

It was the Indian National Union formed by A.O. Hume that assumed the name Indian National Congress at the conference held in Bombay under the Presidentship of W.C. Banerjee, a veteran lawyer of Calcutta. It was attended by 72 delegates from all over India.

The birth of the Indian National Congress was an unprecedented phenomenon in the political history of India. It marked the entry on the new educated middle class into national politics. The middle class, a byproduct of the British Raj, was mainly composed of three classes—agricultural, industrial and professional. Each class had its own interests but a growing sense of nationality—often extolled as patriotism—united them in a common programme of action.

These classes were not caste-bound nor tied down by traditional customs. Fed on revolutionary ideas born of the American War of Independence and the French Revolution, they soon separated themselves into two groups—the extremists and the moderates—the equivalents of modern *hawks* and *doves*.

Annual Session. From 1885 onwards the Indian National Congress met every

year. Its influence spread rapidly among the middle classes. Three main topics engaged its attention: (1) representative government and expansion of the number and functions of legislative councils both in the provinces and at the centre, (2) Indianisation of higher services, (3) Indian poverty.

In 1886 the Congress resolution on Indian poverty read as follows: "That this Congress regards with the deepest sympathy and views with grave apprehension the increasing poverty of the vast numbers of the population of India and desires to record its firm conviction that the introduction of representative institution will prove one of the most important political steps towards the amelioration of the condition of the people".

In 1889 at the fifth congress meet, the protection of the minority communities under a representative government was specifically urged. The minorities included Parsis, Christians and Muslims—and Hindus when they were in a minority in any particular area. This resolution formed the seed-bed of communal representation which in later years loomed dangerously on the political horizon.

The criticism of the Congress-led educated classes regarding the indifference and imperviousness of the British administration to the welfare of the Indian masses naturally annoyed the government which began to indulge in repressive measures. This encouraged the extremists who became more popular and consequently more venturesome.

Partition of Bengal. As the 19th century drew to a close—to be precise on December 30, 1898—Lord Curzon* came down to India as Viceroy. "Curzon was a brilliant intellectual—scholar, writer, speaker—but he was inordinately ambitious, overwhelmingly vain, obstinate, heedless of advice, contemptuous of opposition, self-righteous, unscrupulous and moody..." (Tara Chand).

The crowning ambition of Curzon was to destroy the political influence of the educated middle class, among whom the Bengali intelligentsia were the most prominent. So his first attention was directed to Bengal. His secretariat pointed out that the province of Bengal as constituted at the time was unwieldy with an area of nearly 190,000 sq. miles, a population of 78.5 million people and a gross revenue of over 1,140 lakh rupees.

There was no direct contact between the heads of the provincial government and the millions of Bengal. What made the question spicy and of special interest to Curzon was the fact that "the influence of East Bengal in the politics of the provinces is great, out of all proportions to the real political importance... These eastern districts of Bengal are a hotbed of purely Bengali movement, unfriendly, if not seditious in character".

So it was proposed (1903) that the province of Bengal should be reduced in size—by the transfer of Chittagong division including the port and the districts of Dacca and Mymensingh to Assam, but leaving Bihar, Chhota Nagpur and Orissa within Bengal. This would add up to a population of about 11 lakh as against 78.5 lakh in the old Bengal. A stupid proposal on all counts, it created an uproar not only in Bengal, but all over India. At countless public meetings, the scheme was

* Curzon's pretensions of superiority were evident even as a student. His compatriots at Oxford composed the famous rhyme

George Nathaniel Curzon is a highly super person

Historic Site

When the Congress Working Committee met at the historic Tejpal Hall, Bombay on December 27, 1985, it was doing something momentous—back-dating the birth of the Indian National Congress. Because the Congress came into being only on December 28 hundred winters ago.

To quote eminent historian A.C. Mazumdar: "The first meeting of the Congress took place at 12 noon on December 28, 1885, in the great hall at the Goculdas Tejpal Sanskrit College, where all the representatives were assembled amidst a distinguished, though somewhat limited, gathering of officials and leading citizens of Bombay."

Even the inscription on the marble plaque outside the Tejpal Hall confirms this: "In this historic hall on December 28, 1885, a band of gallant patriots laid the foundations of the Indian National Congress, which during these 50 years has been built up stone by stone, tier by tier, by the faith and devotion, courage and sacrifice of countless men and women, as the pledge and symbol of the invincible purpose to secure to India, their motherland, her legitimate birth-right of Swaraj. This tablet is placed to commemorate the occasion of its golden jubilee, December 28, 1935."

execrated and anathematised but the government remained adamant.

In 1905 Curzon was compelled to revise his plan. The new scheme reduced the old province of Bengal in size and population (141,550 sq. miles and 544 lakhs) and created a new province called East Bengal and Assam consisting of an area of 106,540 sq. miles and a population of 310 lakh. The partition came into effect by a Royal Proclamation on 16th October, 1905.

Condemned. The scheme was condemned not only in India but also by the British Press. *The Times* (London) wrote "It is impossible not to sympathise with repugnance of their (Bengalis) leaders from

arrangements which thus divided them under two separate governments". The Manchester *Guardian* observed "It is hard to explain, though it is still harder to excuse his (Curzon's) support of the scheme for cutting Bengal into pieces".

The Indian National Congress, unanimously condemned the partition. In the two Bengals themselves over 2000 public meetings, attended by 500 to 50,000 people were held. In these meetings Hindus and Moham-medans joined in the protests with equal zeal and earnestness. The courage with which Bengal faced its trial stirred the whole of India.

The constitutional agitation so far pursued had ceased to declare dividends. The Swadeshi movement and boycott of foreign goods, became the mainstay of the freedom movement. Side by side, open defiance of government orders, refusal to pay taxes and *bandhs* and *hartals* followed one after the other. The Congress approved the boycott of foreign goods—particularly cloth. The Swadeshi movement gave a fillip to indigenous industries especially in textiles.

Among the retaliatory measures adopted by the Government the first was the stoppage of grant to schools and colleges and their disaffiliation from the recognised universities. Peaceful agitators were broken up by the military, especially by the reckless Gurkha regiments. Flogging of agitators became a daily occurrence.

Meanwhile the new Lt. Governor of East Bengal, Bampfye Fuller, tried to win over the Muslim population, castigating the Congress as a Hindu organisation and offering special aids and encouragement to Muslim institutions.

Lord Minto who succeeded Curzon followed a judicious policy of admixture of the carrot and the stick, that is, unfaltering repression on the one hand and bonafide attempts at ushering in political reforms on the other. The 1905 session of the Congress at Banaras is in a sense, a turning point in the history of the Congress.

The president, Gopalakrishna Gokhale, though a moderate himself, approved of aggressive agitation. There were, however, a good number of old timers including Gokhale who feared that aggressive tactics, would lead to terrorism and that the national

movement itself would get out of hand and become counterproductive.

Radical Change. 1905 also marked a radical change in the functioning of the Congress. So far, the Congress was merely a series of annual conferences at different places. From 1905 it started functioning as a permanent organisation, though annual elections often led to a change of working personnel.

In 1906 the police broke up a Congress conference in Barisal (Calcutta). The delegates were lathi-charged. Eminent leaders were man-handled by the police. This unprecedented treatment meted out to a peaceful gathering led to a radical change in the character of the national movement.

Hereafter, force was to be met by force. The white man's blood was to atone for the innocent blood drawn from inoffensive nationalists. This was a victory for the extremists. A crop of revolutionary leaders emerged—Aswini Kumar Dutt, Brahma Bhandhab Upadhyaya, Arobindo Ghosh, Lajpat Rai and Bal Gangadhar Tilak. Tilak was from Maharashtra, and easily led the others. In Bihar, Khaparde emerged as the leader and Lajpat Rai led Punjab.

Before terrorism was adopted as a general policy, isolated killings had taken place. Chaphekar brothers in Maharashtra had shot two British officers, Rand and Ayerst. But from 1906 onwards regular terrorism broke out. In this Bengal, as usual, led. B.K. Ghose, B.N. Dutt and B.B. Upadhyaya were the leaders behind the terrorist movement in Bengal. Arobindo Ghosh, then in Baroda came down to Calcutta, to reinforce the movement.

The most important terrorist organisation was *Anushilan Samithi* with its headquarters at Calcutta. In East Bengal, Dacca became the main centre. The Anushilan Samithi ostensibly an organisation for promoting physical development and social welfare, soon found followers all over India. The growth of terrorist activity was deplorable but in the circumstances inevitable.

Swadeshi Movement. Originally this movement had affected only established cottage industries—particularly handloom textiles. Now bigger entrepreneurs came on the scene, establishing heavy industries.



Facimile of four new stamps bearing the pictures of Congress Presidents

Similarly, the boycott of British goods continued on a greater scale than before. Bonfires of foreign goods were conducted on a large scale in all big cities.

The sales of textiles in eight districts of Bengal fell from Rs.77,000 in 1904 to Rs.10,000 in 1905. Twenty new cotton mills were started in Bombay and Ahmedabad. 15 new

banks and 5 shipping companies were floated. Thus there was an overall increase of big industrial units in several spheres.

While everybody supported the Swadeshi movement many disapproved of the boycott programme and still more, the terrorist activities. Their main fear was that this would alienate British public sympathy for Indian

Land-marks In 100 Years.

Ramsay Mac-Donald would have presided over the 26th session of the Indian National Congress in 1911 at Calcutta had not his wife died. He later became the Prime Minister of the United Kingdom.

★ ★ ★

Phirozshah Mehta, president-elect of the 24th session at Lahore in 1909, suddenly decided not to attend it following Lady Madhta's warning that Surat would be repeated.

The 1907 Surat session ended in chaos. Lokmanya Tilak faced an audience of fist-shaking 'moderates'.

He defied their threats only to have a shoe aimed at him which instead struck Surendranath Banerjee and canoned off Phirozshah Mehta. The rest was chaos, as

delegates struck at anyone who looked like a moderate.

★ ★ ★

At the 22nd session at Calcutta in 1906 the party accepted the aim of "swaraj". Dadabhai, presiding over the session for the third time, introduced this expression.

However, it was Tilak who picked it up and made into a movement for mass awakening.

★ ★ ★

Dadabhai died before the 32nd session at Calcutta in 1917. Tilak died three years later and his political opponent, Gopal Krishna Gokhale left the scene before the 30th session at Bombay in 1915.

With the death of these stalwarts, the party entered a new phase under the leadership of Mahatma Gandhi and Motilal and Jawaharlal Nehru.

aspirations and harden the hearts of the rulers, just as the plagues of Egypt hardened the heart of Pharaoh against the Israelites.

The Congress ranks sought a via media by appealing to Dadabhai Naoroji, the grand old man of India to preside over the Calcutta session in 1907. Dadabhai tried his best to placate both parties and proposed a new common platform for both, namely *Swaraj* or self-rule as the goal of the National Congress.

Hindu-Muslim Faction.

Fuller, the Lt. Governor of the newly created East Bengal province, was a typical imperial bureaucrat. He exploited Hindu-Muslim differences of opinion to create faction. He openly supported the Muslim majority and discriminated heavily against the Hindu minority in the province. He let loose unbridled repression in East Bengal, humiliating and insulting respected Hindu leaders, ruthlessly punishing teachers and students and carefully discriminating between Hindus and Muslims at every turn.

Minto, the Viceroy, did not approve of Fuller's policy as it violated the spirit of the Central policy, that is an admixture of the carrot and the stick. The Secretary of State Morley fully endorsed the Viceroy's view

point. Fuller did not agree with the views of his superiors in the matter and offered to resign rather than fight them. Fuller vacated the scene.

But the seeds of distrust and suspicion between Hindus and Muslims which he had sown sprouted. Already, the Muslims were chagrined at the Hindu religious rituals like fasting and tying coloured thread (*Raksha Bandhan*) which usually accompanied agitational programmes like boycott and picketing. The preferential treatment extended to Muslim government employees by Fuller at the expense of the Hindu employees made the Muslims loyal supporters of the imperial regime. The sudden termination of Fuller's services embittered the Muslim community but they were soon reassured by the Viceroy that there was no change of government policy towards the Muslims.

The Muslims, in fact, formed a political organisation, tentatively named *Muslim League*, which published anti-Hindu and pro-government pamphlets. A *Red Pamphlet*, very much in circulation, claimed that the government was on their (Muslims') side, that crimes against Hindus, that is, looting Hindu shops, abducting Hindu women, etc.

CONGRESS PRESIDENTS 1885-1947

1885	W.C. Bannerjee	1917	Mrs. Annie Besant
1886	Dadabhai Naoroji	1918	(Special Session) Hassan Imam
1887	Badruddin Tyabji	1918	(Annual Session) M.M. Malaviya
1888	George Yule	1919	Motilal Nehru
1889	Sir William Wedderburn	1920	(Special Session) Lajpat Rai
1890	Sir Pherozeshah Mehta	1920	(Annual Session)
1891	P. Ananda Charlu		Vijayaragavachariar
1892	W.C. Bannerjee	1921	C.R. Das (In Prison) Acting
1893	Dadabhai Naoroji		President Hakim Ajmal Khan
1894	Alfred Webb	1922	C.R. Das
1895	S.N. Banerjee	1923	(Special Session) A.K. Azad
1896	Rahimtulla Sayani	1923	(Annual Session) Mohammed Ali
1897	C.S. Nair	1924	M.K. Gandhi
1898	A.M. Bose	1925	Mrs Sarojini Naidu
1899	R.C. Dutt	1926	S. Srinivasa Iyengar
1900	N.G. Chandravarkar	1927	Dr. M.A. Ansari
1901	D.E. Wacha	1928	Motilal Nehru
1902	S.N. Banerjee	1929-1930	Jawaharlal Nehru
1903	L.M. Ghosh	1931	Vallabhbhai Patel
1904	Sir Henry Cotton	1932	R. Amritlal
1905	G.K. Gokhale	1933	Mrs. J.M. Sen Gupta
1906	Dadabhai Naoroji	1934	Rajendra Prasad
1907	Dr. Rashbihari Ghosh	1935	Rajendra Prasad
1908	Dr. Rashbihari Ghosh	1936	Jawaharlal Nehru
1909	M.M. Malaviya	1937	Jawaharlal Nehru
1910	Sir William Wedderburn	1939	Subhas Chandra Bose
1911	B.N. Dhar		(Subhas Chandra Bose was re-elected
1912	R.N. Madholkar		but had to resign. Rajendra Prasad
1913	Syed Mohammad Bahadur		appointed in his stead)
1914	Bhupendra Nath Basu	1940-46	(Maulana) Abul Kalam Azad
1915	Sir S.P. Sinha	1946 (July-Sept.)	Jawaharlal Nehru
1916	A.C. Mazumdar	1946-47	J.B. Kripalani

will be overlooked by the authorities. Morley welcomed the formation of such a League, characterising it as a "native opposition" to the Congress. The policy of *divide et impera* had begun, in earnest.

"In an atmosphere made tense by propaganda and counter propaganda," says Tara Chand, "it is not surprising that clashes occurred. Rioting had begun in Mymensingh district in April and May 1906 causing panic among the Hindus".

"Communal riots on a bigger scale occurred in 1907 at Comilla in Triperah district and in Jamalpur taluk of Mymensingh district". These riots were to become almost a daily occurrence everywhere in British India in future.

Congress Split. Differences of opinion regarding attitudes and policies to be adopted in the National Movement came to a

head in 1907 when the Congress met at Surat. The moderates (doves) in the Congress who included such statesmen as Gokhale, Pherozshah Mehta, Surendranath Banerjee and Madan Mohan Malaviya were against the extremist programme of action, lest it should strengthen the anti-Indian stance of the British public.

The extremists who also contained a galaxy of celebrities like Tilak, Arobindo Ghosh, Bipin Chandra Pal and Lala Lajpat Rai had no faith in the bonafides of the British Indian government or in the goodwill of the pro-Indian section of the British public. Leaders of the extremist faction wanted to "capture the Congress and make it an instrument of revolutionary action".

The proceeding of the Surat session was marred by threats and counter threats. Utter lack of discipline characterised the session

from the start. It ended just as ignominiously. the police had to interfere to close the meeting and to clear the pandal. The Congress had split.

The moderates retained control of the Congress. They met immediately after and drafted the new creed of the Congress. Only those who accepted the new creed were eligible for membership. This naturally excluded the extremists. The moderates, thus left alone, had to keep the Congress going as best they could.

Since Independence. There have been 15 Congress Presidents including the present President, Mr. Rajiv Gandhi since independence. Even though the congress split in 1969, the Election Commission on Jan. 12, 1971 and subsequently the Supreme Court, on Nov. 11, 1971, ruled that the faction led by Jagjivan Ram was the real Congress. On July 23, 1981, after the 7th Lok Sabha elections, the Election Commission finally recognised the Congress led by Mrs. Indira Gandhi as the legitimate organisation.

On the other side, the Congress faction opposed to Mrs. Indira Gandhi has been led by veterans like Messers S. Nijalingappa, Devraj Urs and Sharad Pawar. Mr. Pawar is the present President of the Congress (S). Also there have been other Congresses like Congress for Democracy (CFD) led by Mr.

H.N. Bahuguna and Congress (J) led by Mr. Jagjivan Ram.

The following are the Presidents of the Indian National Congress since independence.

1948 Jaipur	Pattabhi Sitaramaiah
1950 Nasik	Purushotam Das Tandon
1951 Delhi	Jawaharlal Nehru
1953 Hyderabad	Jawaharlal Nehru
1954 Kalyan	Jawaharlal Nehru
1955 Avadi	U.N. Dhebar
1956 Amritsar	U.N. Dhebar
1957 Indore	U.N. Dhebar
1958 Pragyotishpur	U.N. Dhebar
1959 Nagpur	U.N. Dhebar
1960 Bangalore	Indira Gandhi
1961 Bhav Nagar	N. Sanjiva Reddy
1962	N. Sanjiva Reddy
1964 Bhubaneswar	K. Kamaraj
1965 Durgapur	K. Kamaraj
1966 Jaipur	K. Kamaraj
1968 Bangalore	S. Nijalingappa
1969 New Delhi	C. Subramaniam
1970 Delhi	Jagjivan Ram
1971 Ahamedabad	D. Sanjivayya
1972 Calcutta	Shankar Dayal Sharma
1975 Chandigarh	D.K. Barooah
1976 New Delhi	Brahmanand Reddy
1978 New Delhi	Indira Gandhi
1983 Calcutta	Indira Gandhi
1984 New Delhi	Rajiv Gandhi

85. REPRESSION AND REFORM

The year 1908 saw a hideous tug of war between the Government armed with powerful weapons of repression and an infuriated people putting up resistance with all their force of will and sacrifice against the onslaught of the other.

The natural result was that agitation went underground. Secret societies were formed everywhere and terrorism became their watchword. Bombs and bullets replaced hartals and processions. The government tied together all suspected persons into conspiracy gangs and prosecuted them wholesale.

Trials and convictions became the order of the day. Outstanding leaders were either imprisoned or deported. Bipin Chandra Pal and Lajpat Rai went into-self-imposed exile. Arobindo escaped to Pondicherry, a French

enclave and Tilak remained incarcerated in Mandalay.

The Government of India armed itself with a series of extraordinary ordinances conferring arbitrary powers of arrest, detention and confiscation for even trivial infringements of the law. *The Explosive Substances Act 1908, The Indian Criminal Law Amendment Act 1908, The Newspapers (Incitement and Offences) Act 1908*, followed the *Prevention of Seditious Meetings Act 1907*, which was already in force. As an epilogue to the whole unsavoury set-up of laws came the *Press Act*

of 1910, which was drawn up to close all loopholes in the Newspapers Act of 1908 and to make it more forbidding and intimidating.

Morely-Minto Reforms of 1909 provided for the greater association of qualified Indians with the Government in deciding public questions. One seat on the Governor General's Council was reserved for an Indian. Satyendra Sinha (later Lord Sinha of Raipur) was the first Indian to be appointed to the Governor General's Council as Law Member. The Governors' Councils of Madras and Bombay were enlarged to contain four members each. An Executive Council was formed in Bengal.

The composition and functions of the Legislative Councils were changed. The number of additional members to the Central Legislature was raised from six to a maximum of 60 of whom not more than 28 were to be officials. The Governor General had the power to nominate three non-official members to represent specified communities. Two other seats were also reserved for nomination. The remaining 27 were to be elected from certain classes like landowners and organisations like Chambers of Commerce.

In the Provincial Councils, the maximum number of members was raised to 50 but the majority of them were to be officials and nominated members. The elected members were again to represent certain specified classes or bodies. The Muslim community was to get representation, through a separate electorate reserved for them. Thus, the principle of communal representation was constitutionally recognised for the first time.

If the reforms were intended to pacify unrest, they failed. The vicious chain of violence, repression and more violence remained unbroken. The mists of doubt and apprehension clouded the horizon.

This satisfied the policy makers in Delhi and London. What they wanted was to boost the Muslim League as a counter weight to the Congress. They knew that the move was likely to create communal conflict and apparently welcomed it for that very reason.

Muslims Restive. The First World War brought Britain into conflict with Turkey, whose Sultan styled himself the Khalif of all Muslims. That the Khalifa to was in danger

shook the passivity of the Indian Muslims and made them restive and thirsting for some sort of action.

The Montague-Chelmsford Report noted that though the Muslims as a whole kept aloof from revolutionary activities from 1903 to 1910 "since 1911 their attitude has been growing far less acquiescent". At the (Royal) Coronation Durbar held on December 12, 1911, two important announcements were made, one was the annulment of the partition of Bengal and the other the transfer of the capital from Calcutta to Delhi.

It was thought that the first would placate the Hindus and the second the Muslims. Both failed to evoke the expected responses. Already, the partition of Bengal had become a side issue as far as the Hindus were concerned. The main issue became a larger share in the government of the country.

The transfer of the capital evoked little or no enthusiasm among the Muslims. One salutary effect was that the old Muslim leaders, who were preferred and pampered by the British found themselves practically ignored. Many of the oldtimers like the Aga Khan and the Nawab of Dacca left the League. Fresh blood like M. A. Jinnah and Muhammed Ali became the leaders of the organisation.

Close Again. The change in leadership helped to bring the Congress and League together. Both represented the middle class intelligentsia of India. The 1913 session of the League at Lucknow, foreswore the oft-repeated loyalty to the crown and adopted 'self-government under the aegis of the British crown' as its political goal. In 1915 the Congress and the League chose the same place (Bombay) for their annual conferences and most of the delegates of both organisations indulged in frequent exchange of ideas. Again in 1916, the Congress and the League met at the same place, Lucknow. At Lucknow the Congress conceded the Muslim demand for separate electorates and the Muslims responded by reducing their weightage in elections in the Muslim majority provinces of Punjab and Bengal. This agreement came to be known later as the *Lucknow Pact*.

With Turkey joining Germany against the allies in the first World War, the loyalty of the Indian Muslims to the British crown became

suspect. The Muslim newspapers which supported Turkey were suppressed and repression was let loose on the Muslims.

Side by side, the British government adopted conciliatory tactics also, like promising that the Muslim holy places outside India will be protected by the allies. Meanwhile, Annie Besant who had joined the Congress joined hands with Tilak in demanding Home Rule for India.

Montford Reforms, so called after Montague, the Secretary of State for India and Chelmsford the Viceroy are contained in the Government of India Act 1919. Before the Act was passed, the British made the historic announcement (Aug. 20, 1917) that the policy of H.M.'s Government... *"is that of increasing association of Indians in every branch of the administration and the gradual development of self-governing institutions with a view to the progressive realisation of responsible government in India as an integral part of the British Empire"*.

The Government of India Act 1919 provided, among other things, for two chambers of legislature at the Centre—the Legislative Assembly and the Council of State. The Assembly was to consist of 103 elected and 42 nominated members. All decisions of the legislature were subject to ratification by the Viceroy. In the provincial sector, a form of dyarchic government was established.

Khilafat Question. With the defeat of Turkey and the abolition of the Sultanate, the Khalifate ceased to exist. This agitated all Muslims in India. The Muslims of the world had no religious head. In 1919 a conference at Lucknow, sponsored by Muslim leaders, the Ali brothers—Muhammad Ali and Shaukat Ali—and Abul Kalam Azad decided to form an All India Khilafat Committee.

Seth Chotani of Bombay was elected President and Shaukat Ali, brother of Muhammad Ali, as the Secretary. Shaukat Ali, who was at the time in prison, was to take charge as soon as released.

Rowlatt Act, so-called after the President of the Committee, which was constituted to review the measures to be adopted to contain the national movement, sought to perpetuate the extraordinary powers conferred on the government during the war period. These were framed as 2 Acts (collec-

tively known as the Rowlatt Act) which the Imperial Legislative Council dutifully passed in March, 1919.

Ire of All. This Act roused the ire of all Indians, Hindus and Muslims alike. Muhammad Ali Jinnah, later to become the President of the Muslim League and the founder of Pakistan, resigned his seat in the Council. In his letter of resignation to the Viceroy he wrote "In my opinion, a government that passes such a bill or such laws in times of peace forfeits the claim to be called a civilized government." The Rowlatt Act, in point of fact, proved a shot in the arm for the Khilafat movement.

As a protest against the arbitrary provisions of the Acts, Gandhiji, on behalf of the Congress called for a *hartal* to be observed on April 6, 1919 all over India. The *hartal* was a complete success.

Punjab saw the worst manifestation of British power. Its Governor, Michael O' Dyer seemed to love brutal savagery. He warned the public that they would be held responsible for the proper conduct of the public meetings and for the language used in the speeches. On the 10th April, when the news of Gandhiji's arrest reached Lahore, the students took out a protest procession. The police opened fire on the unoffending processionists wounding many.

Worse was the fate of Amritsar, which held protest demonstrations. Satyapal and Kitchlew were prohibited from speaking at Amritsar and were arrested for deportation. The news of deportation infuriated the people. Crowds marched to the Deputy Commissioner's office to demand the cancellation of the order of deportation. Mounted police fired upon the crowd, killing some and wounding many.

Jallianwallabagh. A protest meeting against this outrage was arranged at Jallianwallabagh on the 13th. The government, in anticipation of trouble, handed over Amritsar to the army under the command of General Dyer. Jallianwallabagh turned out to be a deadly trap. An enclosure, protected by high walls, had only one small entrance on one side and three or four small openings on the other. As the crowds filled the enclosure, Dyer and his troops appeared at the main entrance and bullets rained on the crowd.

Men died in hundreds, while most of those who sought escape through the narrow openings on the other side were crushed to death in the melee. The massacre at Jallianwallabagh was an act of unprovoked savagery, unequalled in history. It shook the country from end to end.

The first Khilafat Conference was held at Delhi on the 23rd November, 1919. It was presided over by Fazlul Huq. Gandhiji, Motilal and Malaviya among the Congress leaders were present. On the second day Gandhiji was voted to the chair. In 1920, when the Congress Committee met at Delhi, Gandhiji presented a programme of *non-cooperation* which was accepted by the Committee.

A few days later the Khilafat Conference also accepted the programme of non-cooperation. In June 1920, the Khilafat Committee met at Allahabad and endorsed the non-cooperation movement in full. This included surrender of titles and honorary posts, resignation from the civil service and the army and refusal to pay any sort of tax.

Non Co-operation. A special session of the Congress in September 1920 ratified the non-cooperation movement. The Congress resolution was strongly supported by the Jamat Ulam-ul-Hind, calling upon all Muslims to participate fully in the movement.

At the next session of the Congress at Nagpur, a new constitution was adopted for the Congress, which enabled it to act as a permanently functioning organisation. Gandhiji explained the non-cooperation movement as a positive movement. "Complete Civil Disobedience", he said, "is a state of peaceful rebellion—a refusal to obey every single state-made law". The new movement caught the imagination of the masses. The educated middle class was already in ferment.

Leading lawyers like Motilal Nehru and C. R. Das, gave up their profession. Subhash Chandra Bose resigned from the Indian Civil Service. From the 1st August 1920 when it started to 6th February, 1922 when it was suspended, the non-cooperation movement moved in a crescendo. The boycott of foreign clothes and bonfires were becoming popular in big cities like Calcutta, Bombay, Madras and Allahabad. The non-cooperation movement was a roaring success.

Chawri Chawra. On the 15th Feb., 1922 a small town Chawri Chawra in the district of Ghorakpur in U.P. became the scene of a violent clash between the police and some processionists. The police took refuge in the station but the mob set fire to it. Gandhiji responded by suspending the non-cooperation movement, as he considered Chawri Chawra an open violation of non-violence.

The sudden suspension of the movement occasioned violent differences of opinion. Most of the Khilafists lost faith in Gandhiji's leadership. Taking advantage of this division in nationalist ranks, the government arrested Gandhiji on March 10, 1922. He pleaded guilty and asked for the severest punishment. He was convicted to 6 years imprisonment and confined to the Yervada Central Prison in Pune (then Poona).

The Congress met in Gaya in December, 1922 under the Presidentship of C. R. Das. A Committee appointed to enquire into the civil disobedience movement, opined that the country was not prepared to continue the movement and recommended that cooperation with the government under the Montford Reforms would be more helpful to the national cause. This meant entering the legislative councils. However, a resolution to this effect was defeated. C. R. Das resigned from the Presidentship on January 1, 1923. He and Motilal Nehru formed the Swaraj Party.

Khilafat Movement, however strong, had ultimately to fizzle out.

Swaraj Party founded by C. R. Das and Motilal Nehru was desirous of working the Montford Reforms, while the Nationalists or Extremists were opposed to it. The Swaraj Party consisting of Moderates and Liberals, contested the 1920 elections and some of them were elected, Srinivasa Sastri and Sivaswamy Iyer among others. They formed a sort of opposition and succeeded in defeating many government motions and abolishing certain obnoxious acts as the Press Act of 1910.

In 1921, the second election for the Central Legislature was held. By the time, many provinces were having their elected Councils. Here also, the Swaraj Party made itself a political force. In the second Imperial Legislative Assembly the Swarajists captured 47 of 105 elected seats. The leader in the

Imperial Legislative Assembly was Motilal Nehru. He was ably assisted by a cadre of celebrities-Vithalbhai Patel, Ramaswamy Iyengar, Bipin Chandra Pal, and others.

The membership of the Councils offered tempting opportunities for ambitious men to aspire for influential positions and cushy jobs.

This naturally led to splits within the party. In June 1925, C. R. Das passed away. With that towering personality out of the scene, open disruptions appeared in the party.

The Viceroy-Lord Reading—took full

advantage of the differing opinions in the Swaraj Party. He affirmed that the government had no ideas of changing its stand, and abolishing iniquitous Acts like the Bengal Ordinance. The Swarajists, finding themselves thwarted at every session, walked out of the Assemblies. Even then, there were a number of leaders like Jayakar, Kelkar, etc. among them who chose to continue cooperation with the government. They formed a new party, the *Responsive Cooperation Party*. It was still-born.

86. PACTS AND CONFERENCES

The prerequisite of 'Swaraj' or independence was an accord between the Hindus and the Muslims. All leaders were agreed on it. The Hindu majority believed that *Swaraj* meant *Muslim Raj* while the Muslim minority was afraid that the Hindu majority would swamp them.

By 1906, the Muslims expressed their fears by demanding separate electorates. The British Indian Government was only too glad to accommodate Muslims. The Government openly favoured the Muslims, on the ostensible ground that they were a minority and needed protection.

During the early years of non-cooperation, it appeared that the two communities came together. But then there was the Khilafat movement link to them together.

Moplah Rebellion. The Moplah (Muslims) rebellion of 1921 in Kerala (then British Malabar) transformed itself as the massacre of Hindu landed families, destruction of Hindu properties and Hindu temples. Even forcible conversion of some Hindus was reported.

The revival of the Hindu Maha Sabha in 1923 added fuel to the fire. In 1924, communal troubles seemed to hold the whole of India in its diabolic grip. Its worst manifestation was at Kohat (North West Frontier Province) on the 9th and 10th September 1924. There were large scale killings of Hindus and looting of Hindu properties and the Hindu population had to be evacuated from the town.

The suspension of the non-cooperation movement following the Chauri Chauri incidents and the vaporisation of the Khalifate (1924) left nationalist India in a political

vacuum. Gandhiji felt that before further political agitation was taken up an organisational and educative build-up was necessary. Although his term of imprisonment extended to 1928 he was unconditionally released in 1924 for reasons of health.

Khaddar. Presiding over the Belgaum Conference in 1924 he laid down the basic programme. He told the delegates, "Go throughout your districts and spread the message of *Khaddar*, the message of Hindu-Muslim unity and the evils of untouchability and take up in hand, the youth of the country and make them the real soldiers of *Swaraj*".

He called upon the conference to adopt as the basic qualification of a Congressman, spinning 2,000 yards of yarn a month, instead of contributing four annas as membership fee. He went round the country spreading the message of Khadi. The response was over-whelming. In September 1925 he called together a meeting of the All India Congress Committee (AICC) in which the political and economic wings of the Congress were separated.

The political programme was to be handled by the Swarajist members of the Congress while the Khadi programme would be taken up by the All India Spinner's Association as an autonomous organisation working within the framework of the Congress. All

Congressmen were called upon to wear only Khadi materials and nothing else.

Year of Silence. In 1926 he retreated to his Ashram at Sabarmati and spent an year of silence, during which he concentrated on the expansion and consolidation of the Khadi programme. On the termination of his year of silence, he declared, "I have come to the conclusion, that we can have Swaraj, even Rama Raj, if we fulfil the triple programme—that is Khadi – Hindu-Muslim unity and the abolition of untouchability".

In the meantime, the Swarajists and Nationalists in the Indian legislatures were demanding that Indians should participate effectively in the administration of the country. Lord Birkenhead (1925) 'Secretary of State for India' derided the idea of Indian nationhood in the House of Lords. He said, "To talk of India as an entity is as absurd as to talk of Europe as an entity...There never has been such a nation. Whether there will be such a nation, the future alone can show".

While the political terrain looked like a desert and hopes of independence a mirage, communal riots continued to rock the country. In Calcutta, Swami Shraddhananda was murdered by a Muslim fanatic. In 1927 the Frontier Muslims rose against the Hindus which led to their exodus to Peshawar.

Simon Commission. In 1927 a Parliamentary Commission was appointed to look into the question of Constitutional Reforms for India and make suitable recommendations. The Commission was headed by Sir John Simon, a leading constitutional lawyer of Britain and a member of Parliament.

The Commission visited India in 1928 and toured throughout the country collecting evidence. The Congress boycotted the commission. The Liberal Federation led by Sir Tej Bahadur Sapru did the same. Even the Muslim League joined the boycott.

While the Commission doggedly pursued its programmes seemingly oblivious of stormy scenes and angry protests, the Government of India felt the impact of the storm and was forced to do something to appease the Indian public. In 1929 Lord Irwin, the Viceroy declared that the natural issue of India's Constitutional progress is the attainment of

Dominion status. The statement also proposed to hold a Round Table Conference on the subject as soon as possible.

Watered Down. The statement which left the Simon Commission "high and dry" raised more storms in the British Parliament than anywhere else. Can a Parliamentary Commission be put aside in such a manner? Where was the justification for announcing Dominion Status as the objective of the British policy in India? The net result was that the concept of Dominion Status was watered down to nothing while the formation of the Round Table Conference remained a dubious proposal.

Meanwhile on March 16, 1927 the Council of State passed a resolution at the instance of C. Sankaran Nair recommending to the Government that no steps towards responsible Government be taken until Hindus and Muslims agreed to dispense with separate electorates.

This resolution brought forth a spate of inter-party negotiations – between various parties and different persons and at differing levels. While there was a general agreement on joint electorates with reservation of seats for Muslims someone or another raised objections on one point or another all the time. This obstructed any final solution. Thus the negotiations dragged on till the end of 1929, when the Congress came out with the outright declaration on 31st December 1929 that "the word Swaraj in Article 1 of the Congress constitution shall mean complete independence".

Dandi March. While the talks continued Gandhiji decided to launch Satyagraha and advised the Viceroy about his decision. His first act was to go to Dandi and make salt which was then a government monopoly. He set out on the march at the age of 61 in March 1930. He reached Dandi with his followers on April 5, 1930. He walked into the sea waters and returning took a lump of salt from the salt fields and thus violated the law.

All repressive laws were soon brought into force. The repealed Press Act of 1910 was revived. Gandhiji and a lot of other outstanding leaders were arrested. In the agitation that followed some 100,000 persons were reckoned to have been imprisoned.

It was expected that with the incarceration of Gandhiji on May 5 at Yervada Jail and the imprisonment of the other leaders the movement would dissipate. The effect was just the contrary. Satyagraha became a way of life for millions of Indians and the leaderless movement grew apace every day. On June 2 Lord Irwin the Viceroy wrote... "the movement is serious and has permeated many strata of Indian society. It has caught their imagination and swept them off their feet and obviously has dangerous potentialities".

First Round Table. In the face of the growing agitations, the Government of India decided to summon a Round Table Conference in London. This was to consist of representatives of the following: (1) all India parties—moderates and extremists alike (2) communal organisations like the Hindu Mahasabha, the Muslim League, the Sikhs, Christians, etc. (3) land-owners and industrialists (4) special Indian groups like the Europeans or Anglo-Indians (5) Indian Princes (6) British Parliament members representing all parties. There were altogether 89 members.

Congress leaders like Gandhi who were in prison were not invited since they laid down a condition precedent for the Round Table, namely the announcement that *Poorna Swaraj* for India was the ultimate objective of the Round Table.

The First Round Table Conference was opened by King George V on November 12, 1930. The King observed, "Ten years is but a brief span in the life of any nation but the decade has witnessed... a quickening and growth in ideals and aspirations of nationhood, which defy customary measurement of time". This was only too true for the progress in nationalist growth during the decade was unique. If the Round Table achieved nothing else it evolved a new concept of true India—a federation consisting of the British administered Provinces and States ruled by Indian princes.

This was a magnificent objective, a "great and mighty conception", as Lord Reading put it. For the rest, the conference was a dismal failure.

The Round Table Conference having failed to achieve any substantial solution of the Indian problem, and the civil disobedience

movement going on with increasing momentum all repressive laws were brought into action again. It was only then that the British authorities realised that there can be no abiding solution of the Indian question, without the active cooperation of the Congress leaders. As a first step towards reconciling the Congress, Gandhiji and the other leaders of the Congress were released from jail on January 26, 1931.

Peace with Honour. Gandhiji on release felt that he wanted peace but with honour. Britain also wanted peace but without trouble. But first, the impasse had to be broken. So Gandhiji wrote to the Viceroy, asking for an interview. A pact was agreed upon during the interview. Gandhiji was spiritualism personified. Lord Irwin was a devout Christian at the bottom site. It was this common character that blossomed forth as the Gandhi-Irwin Pact in March 1931.

The main points were (1) Federal character of free India (2) Participation of the Congress in all negotiations (3) Civil Disobedience movement will be discontinued (4) Boycott of British goods may be resorted to on a propagandist basis but not as a political weapon (5) Picketing and boycott activities may be carried on but without offending the existing laws (6) Ordinances promulgated to countenance Civil Disobedience movement and consequential acts following upon them, like prosecutions and confiscations, will be rectified as far as they were possible of rectifications.

The Gandhi-Irwin pact was ratified by the conference at its Karachi Session presided over by Vallabhai Patel on March 29, 1934. The *Second Round Table Conference* which opened on the 7th September 1931 was distinguished by the fact that the Congress participated and was represented by Gandhiji as the sole delegate of the Congress.

By this time, a National government by Ramsay Macdonald was formed in Britain. It was dominated by the Conservative Party. Sir Samuel Hoare succeeded Wedgewood Benn as the Secretary of State for India, while Lord Willingdon replaced Irwin as Viceroy. This change complicated matters. The British authorities wanted to exploit the communal tangle to the utmost.

Thorny Question. There were more than 104 members for the Second Round Table including Gandhiji. The Muslim question had already become acute with extremists gaining the upper hand in the Muslim League. In April 1931 the All India Muslim League declared their minimum programme which contained 10 demands: (1) autonomy of the federating units (2) Residuary Powers for the States (3) Transfer of power to Provincial governments (4) Federal subjects to be selected by the consent of the provinces (5) No difference in the powers exercised by the British provinces and the Indian States (6) One-third of Federal seats to go to the League (7) Muslim majority rule in Muslim-majority provinces (8) Separate communal electorates (9) Muslim members in both Federal and Provincial cabinets (10) No legislation in communal matters, if the $\frac{3}{4}$ of the community members objected.

A Minorities Sub-Committee was appointed by the Second Conference, presided over by the British Prime Minister. Here all minor groups agreed with the Muslim League on one point—that their interests should be maintained and protected, whatever form the Constitution assumed. It was difficult to provide such a blanket assurance to all minorities big and small. The conference concluded without reaching any decision.

When Gandhi returned to India in December 1931 the country was labouring under a load of repressive laws called Ordinances. 15 Ordinances were passed in 1931 alone. The only remedy left was to resume civil disobedience.

In the North West Frontier Province Abdul Gaffar Khan (since known as the Frontier Gandhi) raised a volunteer corps of one lakh Pathans called the Servants of God and affiliated it to the Congress. In Bengal, terrorism began again. The Government issued more harsh and stern Ordinances, including the muzzling of the press, detention of suspects and unfettered freedom for the executive to do whatever they thought fit.

In 1932 the working committee of the Congress called upon the nation to resume Civil Disobedience including nonpayment of taxes. Fresh ordinances were promulgated by the Government. All outstanding leaders

of the Congress were arrested and imprisoned.

Communal Award. The Second Round Table having failed to solve the communal problem, the British Prime Minister took it upon himself to do it. In August 1932 Prime Minister Ramsay Macdonald announced the communal award. The Award was based on the British theory that India was not a nation but congeries of racial, religious and cultural groups, castes and interests. The following minorities were recognised under the Award—Muslims, Depressed classes, Backward classes, Indian Christians, Anglo-Indians, Sikhs, Europeans, Landholders, Commercial and Industrial classes, Labour and Universities. These were given more than their legitimate shares of seats in the legislatures.

As a protest against the proposal Gandhiji started a fast on Sept. 26, 1932. The news sent a shiver through the nation. The leaders of the upper caste Hindus and those of the depressed classes met and came to an agreement on the question. This is known as the *Poona Pact*. They requested the Government to drop the proposal for separate electorates. The Government of India agreed to do so and Gandhiji broke his fast on Sept. 29, 1932.

The *Third Round Table* met in London on November 17, 1932 and continued its deliberations till December 24. This session was only a shadow of the earlier conferences. Jinnah was not invited. The princes were not interested and sent their ministers to the conference. Sir John Simon was one of the British delegates who attended. After the end of the conference the British Government published a White Paper which practically reproduced the Simon Commission recommendations but added a scheme for a Federal Government if the Princely States agreed. The White Paper in due course became the Government of India Act 1935.

Impractical. The Act of 1935 provided two alternate constitutions for the Central Government—one a Federal Government consisting of British provinces and Indian States, that is, if a majority of Indian States were willing to accede to the Federation. This never happened. The second alternative was to work the 1919 Act with some

modifications. This was the alternative finally accepted. In this as in all previous Acts, the Governor-General had overriding authority in all matters.

Provincial constitutions proposed were markedly different from the previous ones. In the first place dyarchy was abolished. The provinces were considered autonomous and were to be governed by ministers chosen from the elected members. The Governor, though, still possessed overriding authority, it was understood that he would not interfere, until a crisis of some sort emerged.

The Act came into operation from April, 1937, so far as the provinces were concerned. The Central Government continued without any major change. After a lot of discussion whether the Congress should cooperate in working provincial governments, it was finally decided that it should. The Congress put up its own candidates in every province. So also did the Muslim League and lesser political parties.

The Congress won with a huge majority in five provinces—Madras, Bihar, Central Province, United Province and Orissa. In the other provinces Congress had acquired a sizeable number of seats. In 1937 the Congress took charge of the governments in seven provinces as interim ministries. In the remaining four provinces—Punjab, Bengal, Assam and Sind,—non-Congress parties took office.

The federal part of the new constitution, having been shelved, the Central Assembly of 1934 continued to function. It continued with 44 Congressmen led by Balabhai Desai and 11 Nationalists under M. S. Aney. Independents who held the balance were led by M. A. Jinnah. The sole purpose of the Central Assembly was to show that it had no confidence in the Government. This was achieved by cut motions, rejections of the Budget, etc. These activities had little impact because the Viceroy had the ultimate power to certify any bill as passed.

87. THE PARTITION

Though partition of India broke into history suddenly and ruthlessly, it had been in the making for a long time. Its roots were visible in the Hindu-Muslim riots which started as early as 1881 and continued intermittently.

The British administration took advantage of these riots so as to encourage the Hindu-Muslim conflict and perpetuate it. Ostensibly, three factors triggered communal riots: (1) Cow protection (2) Hindu-Urdu controversy and (3) Assertions of religious privileges on the occasions of festivals and holy days, especially when Hindu and Muslim calendars coincided.

These were only the apparent causes. The real reasons were more political than religious.

The formation of the All India Muslim League at Dacca (now Dhaka) in December, 1906, provided a focal point for Muslim political aspirations. When Muhammed Ali Jinnah became President of the League, he started defaming and devaluing the Congress, as a national organisation.

In 1937, when the Congress and the Muslim League started working provincial

ministries, the rivalry between the two organisations came into the open.

In 1937, Jawaharlal Nehru wrote to Jinnah, "In the final analysis, there are only two forces in India today—British Imperialism and the Congress representing Indian Nationalism", Jinnah replied pointing out (1) that the Hindus and Muslims had nothing in common and (2) that the Muslims of India constituted a separate nation and therefore needed a separate state. The rift was complete.

Power Cut. The Congress suffered a great impairment of power by the separation of Jinnah. Jinnah, who had resurrected the League, towered above all other Muslim leaders and the Muslim community as a whole supported him. However, the Congress claimed some Muslim leaders, who were distinguished from the League adherents as nationalist Muslims. Abul Kalam

Azad was one such. The essential trouble here was that leaders like Azad were few and far between and commanded little mass support among the Muslim community. The British government openly supported the Muslim League. So the partition of India was only a question of time.

The outbreak of the Second World War, which commenced with Hitler's invasion of Poland on September 1, 1939, called for a complete change of policy on both sides—the British Indian Government and the National Congress. India was declared a belligerent nation by Britain on September 3, 1939, and the British Indian administration was placed on a war footing. The war lasted 6 years, till September 1945. During this period there was a lull in national agitation.

The Congress, as a whole supported the democratic allied countries, led by Britain but resented the fact that it was not taken into consultation in declaring India a belligerent nation. In the circumstances, all that the Congress could do was to call for an immediate assurance from Britain, that independence would be given to India, as soon as the war emergency was over.

Mass Resignation. The British Government paid no heed to this demand. The Congress reacted by asking all provincial Congress ministries to resign (October 1939). When the Congress ministries resigned, the Muslim League observed 'The Deliverance Day' from Congress rule on 22nd December, 1939. This was an indication of the increasing animosity between the two organisations.

In March 1940, at its annual session in Ramgarh the Congress demanded complete independence and a Constituent Assembly to draft a constitution for free India. In the same month, the Muslim League at its Lahore session demanded a separate state for the Muslims of India. In August the Viceroy announced that his Executive Council would be expanded to include more Indians, and a war advisory council established. Both the Congress and the League rejected the offer.

In March 1942, the British Government sent Sir Stafford Cripps to India with proposals for a new constitution. The Cripps' proposals were found unsatisfactory and were rejected both by the Congress and the League. In May 1942, Gandhiji called on

Britain to "Leave India to God. If this is too much, then leave her to anarchy".

Quit India. In August 1942, the Congress working committee considered Gandhiji's call to Britain and passed the famous 'Quit India' resolution. If Britain did not take steps to quit India, as soon as possible, the Congress proposed to start Civil Disobedience. The Government retaliated by arresting Gandhiji and all the members of the working committee and declared Congress an unlawful organisation.

In 1945, Lord Wavell, the Viceroy, announced that he was holding a conference in Simla to consider the steps necessary to advance self-government for India in the near future. All Congress leaders, then in prison, were released. The Simla conference (June-July 1945) turned out to be a fiasco. But by the time, (July), a Labour Government came into power in Britain. The Labour Government took serious notice of the Indian situation.

The Labour Secretary of State for India, Lord Pethick-Lawrence announced that a parliamentary commission would be visiting India to negotiate the question of Indian independence. This delegation, later famous as the Cabinet Mission, announced its constitutional scheme, which implicitly recognised the right of the Muslims to have a state of their own. While the Muslim League accepted the proposals, the Congress rejected it.

While negotiations on the future constitution continued between the Congress and the League, on the one side and with the Government on the other, the League suddenly changed its tactics. It retracted its acceptance of the Cabinet Mission Plan and declared August 16 (1946) as a Direct Action Day. It was an invitation for communal riots. The Muslims started slaughtering Hindus in all areas, where they were numerically superior. The Great Calcutta Killings of August 16 to 18 were the first of the riots. Then followed the killings in West Punjab where the Muslims were in a majority. The Congress in desperation demanded a partition of Punjab.

Lord Mountbatten who succeeded Wavell as Viceroy in March 1947, boldly announced the partition of India. The provinces where

the Muslims formed the majority were to be constituted into a separate state—Pakistan.★

Thus, parts of Punjab (West Punjab) and Bengal (East Bengal) and the whole of the provinces of Sind, Baluchistan and the North

West Frontier became Pakistan. The rest of India formed another State. The Indian Independence Act, passed by the British Parliament (July 1947), formalised the division of India into two fully independent states—India & Pakistan.

88. FATHER OF THE NATION

Mohandas Karamchand Gandhi (1869-1948), when he entered public life, was at first hailed as the Mahatma (Great Soul) and was generally called Mahatma Gandhi. Since his death he has been universally acclaimed as the Father of the Nation.

Gandhiji started his public career in South Africa, where the white race ruled and Indians and native Africans alike were treated as slaves and outcasts. He entered Indian public life through the Indian National Congress, which he dominated from 1920 onwards. He was the main architect of the Indian nation and is rightly called the Father of the Nation.

The important dates and events of his life are briefly described below:

Gandhian Chronology. 1869: Oct. 2: Born at Porbandar, Kathiawar, India, son of Karamchand and Putlibai Gandhi. 1883: Married Kasturba. 1888: Sailed from Bombay for England to study law. 1891: Summer: Returned to India after being called to the Bar. Began to practise law in Bombay and Rajkot.

1893: April: Sailed for South Africa to become lawyer for an Indian firm. Found himself subjected to colour discrimination. 1894: May: Organized the Natal Indian Congress. 1899: Organized Indian Ambulance Corps for British in Boer war. 1901: Embarked with family for India.

1901-2: Travelled extensively in India, attended Indian National Congress meeting in Calcutta and opened law office in Bombay. 1902: Returned to South Africa at the request of the Indian community. 1904: Established the weekly journal 'Indian Opinion', Organized Phoenix Farm near Durban.

★ The name Pakistan and the idea of a partition were first suggested by Chowdhry Rahmat Ali, a student of the Cambridge University in 1930. In his pamphlet 'Now or Never', published in 1933, Rahmat Ali advocated the idea of a partition. At the time, however, Muslim leaders scorned the idea as childish.



1906: Sept: First 'satyagraha' campaign in protest against proposed Asiatic ordinance directed against Indian immigrants in Transvaal. 1907: June: Organized 'Satyagraha' against compulsory registration of Asiatics (The Black Act).

1908: Jan: Stood trial for instigating 'satyagraha' and was sentenced to two months imprisonment in Johannesburg jail (his first imprisonment). Summoned to consult General Smuts at Pretoria; compromise reached; was released from jail. Feb: Attacked and wounded by Indian extremist for settlement with Smuts. Aug: After Smuts broke agreement, second 'satyagraha' campaign began with bonfire of registration certificates.

Incarcerated. 1909: Feb: Sentenced to three months imprisonment in Volksrust and Pretoria jails. June: Sailed for England to present Indian's case. 1910: May: Established Tolstoy Farm near Johannesburg. 1913: Sept: Helped campaign against nullification of marriages not celebrated according to Christian rites. Third 'satyagraha' campaign. Led 2,000 Indian miners from New Castle across Transvaal border. Nov: Arrested for third time in four days. Dec: Released unconditionally in expectation of a compromise.

1914: July: Returned to India, leaving South Africa for ever. 1915: May: Established Satyagraha Ashram near Ahmedabad.

1917: Moved Ashram to new site on Sabarmati River. Led successful 'satyagraha' campaign for rights of peasants on indigo plantations in Champaran. Defied order to leave area in April, was arrested at Motihari and tried, but case was withdrawn.

1918: Feb: Led strike on millworkers at Ahmedabad. Millowners agreed to arbitration after his three-day fast (his first fast in India). March: Led 'satyagraha' for peasants in Kheda. April: Organised nationwide hartal—suspension of activity for a day—against the Rowlatt Bills. Fasted at Sabarmati for three days in penitence for violence and suspended 'satyagraha' campaign which he called a 'Himalayan miscalculation' because people were not disciplined enough. Became Editor of English weekly 'Young India' and Gujarati weekly 'Navajivan'.

Non-Co operation. 1920 April: Elected president of All India Home Rule

League. Successfully urged resolutions for a 'satyagraha' campaign of non-cooperation.

1921: Resolved to wear only a loin cloth to propagate homespun cotton and to signify his identification with the people. Mass civil disobedience, thousands went to jail. Gandhi invested with 'sole executive authority' on behalf of Indian Congress.

1922: Suspended mass disobedience because of violence at Chawri Chawra and undertook five-day fast of penance at Bardoli. Arrested at Sabarmati on charge of sedition for articles in 'Young India'. Pleaded guilty in famous statement at the 'great trial' in Ahmedabad before judge Broomfield. Sentenced to six years' imprisonment in Yeravada jail.

1929: Arrested for burning foreign cloth in Calcutta and fined one rupee. 1929 Dec: Congress session at Lahore voted for complete independence and a boycott of the legislature. January 26 proposed as National Independence day. Third all-India 'satyagraha' campaign.

1930: March 12: Set out from Sabarmati with 79 volunteers on historic Salt March 200 miles to sea at Dandi. April 6: Broke salt law by picking a handful of salt up at seashore. Arrested by armed policemen at Karadi and imprisoned in Yeravada jail without trial. One hundred thousand persons arrested.

1931: Jan: Released unconditionally with 30 other Congress leaders. March: Gandhi-Irwin (Viceroy) Pact signed, which ended civil disobedience. Aug: Sailed from Bombay for the Second Round Table Conference in London. Dec: Returned to India. Authorised by Congress to renew 'satyagraha' campaign (fourth nationwide effort).

Fast unto Death. 1932 Jan: Arrested in Bombay with Sardar Patel and detained without trial at Yeravada prison. Sept. 20: Began 'fast unto death' while in prison in protest of British action giving separate electorate to untouchables. Sept. 26: Concluded "fast" in the presence of Rabindranath Tagore after the British accepted 'Yeravada Pact'.

1933: Began weekly publication of 'Harijan' in place of 'Young India'. July: Disbanded Sabarmati Ashram which then became centre for removal of untouchability. Nov: Began ten-month tour of India to help end untoucha-

bility. Nov: Kasturba arrested and imprisoned for sixth time in two years.

1934: Summer: Three separate attempts made on his life. Oct: Launched All India Village Industries Association. 1940: Oct: Launched limited, individual civil disobedience campaign against Britain's refusal to allow Indians to express their opinions regarding World War II. 23,000 persons imprisoned within a year.

1942: March: Met with Sir Stafford Cripps in New Delhi but called his proposals 'a postdated check' these were ultimately rejected by Congress. Aug: Congress passed 'Quit India' resolution—the final nation-wide "Satyagraha campaign" with Gandhi as the leader. Aug 9: Arrested with other Congress leaders and Kasturba and imprisoned in Aga Khan Palace, near Poona, with revolts in many parts of the country.

1943: Feb 10: Began fast at Aga Khan Palace to end deadlock between Viceroy and Indian leaders.

Kasturba Dies. 1944: Feb 22: Kasturba died in detention at Aga Khan Palace at the age of 74. May 6: After decline in health, was released unconditionally from detention (this was his last imprisonment; he had spent 2,338 days in jail during his life-time). Sept: Important talks with Jinnah of Muslim League in Bombay on Hindu-Muslim amity.

1946: Nov: Began four-month tour of 49 villages in East Bengal to quell communal rioting over Muslim representation in provisional government.

1947: March: Toured Bihar to lessen Hin-

du-Muslim tensions. Began conferences in New Delhi with Lord Mountbatten and Jinnah. May: Opposed Congress decision to accept division of country into India and Pakistan. Aug 15: Fasted and prayed to combat riots in Calcutta as India was partitioned and granted Independence. Sept: Visited Delhi and other neighbouring areas to stop rioting and to visit camps of refugees.

Martyrdom. From 1946 onwards, Gandhiji's efforts were concentrated on effecting Hindu-Muslim accord. Hindu-Muslim riots had broken out all over India, ever since the League President, Jinnah, rejected the Cabinet Mission Plan and proclaimed August 16, 1946 as Direct Action Day. It was never clarified what Direct Action really involved. But the Muslim response was instantaneous and murderous. They started killing Hindus, wherever they (Muslims) held numerical superiority. The great Calcutta killings of August 16/18 were the first bitter harvest of the Direct Action Day. Then the killings spread to all areas, where the Muslims were enjoying a majority. Gandhiji visited many of these areas—Naokholi for instance—to restore communal amity. But these visits brought forth no substantial change.

So, on January 13, 1948 Gandhiji undertook a fast for 5 days to bring about communal unity. On January 30, while holding a Prayer Meeting at Birla House, Delhi, Gandhiji was shot dead by a Hindu fanatic Vinayak N. Godse, who was deadly opposed to Gandhiji's efforts to bring about Hindu-Muslim amity. Thus ended the life of the greatest Indian since the Buddha.

89. FREEDOM AND AFTER

British Government announced on Feb. 20, 1947 its intention to quit India by June 1948. Lord Mountbatten was named Viceroy to arrange the transfer of power. He assumed office on March 24 and broadcast his plan for a partition of India.

1947: British Parliament passes the India Independence Act (July 1) and fixes Aug 15 for the transfer of power. Partition of India into India & Pakistan. Power transferred to India and Pakistan. Lord Mountbatten becomes Governor General of India and M. A. Jinnah Governor General of Pakistan (Aug. 15).

1948: Assassination of Mahatma Gandhi (Jan. 30). Death of M. A. Jinnah (Sept. 11). The Government of India occupies the Nizam's dominions (Hyderabad State). 1949: Constitution of India adopted by the Constituent Assembly (Nov. 26). 1950: Constitution of India comes into force (Jan. 26). Sardar Patel

dies (Dec. 15). 1951: The First General Election in India. First Amendment to the Constitution. 1952: Dr. Rajendra Prasad elected Rashtrapati (Head of State). Second Amendment. 1954: Panch Sheel agreement between China and India. Third Amendment.

Socialism Adopted. 1955: Avadi Session of the Indian National Congress adopts a socialistic pattern of society for India. 4th and 5th Amendments. 1956: Life Insurance nationalised. 6th and 7th Amendments. States Reorganisation Act. 1957: Second General Election. Rajendra Prasad re-elected for a second term.

1958: Metric system of weights and measures introduced. 1959: Swatantra Party formed. 8th Amendment. 1960: Bombay bifurcated into Maharashtra and Gujarat States. 9th Amendment. 1961: India occupies the Portuguese enclaves of Goa, Daman and Diu. 10th and 11th Amendments.

1962: Third General Election in India. Dr. Radhakrishnan elected President. Nehru forms the third Congress ministry. China attacks India on the northern border (Sept. 19). 12th, 13th and 14th Amendments. 1963: Gold Control Order. Rajendra Prasad dies (Feb. 28). Nagaland becomes a state of the Indian Union. Union Territory of Goa forms its own cabinet and legislature. 15th and 16th Amendments.

Death of Nehru. 1964: Pandit Nehru, Prime Minister of India, dies, (May 27). Lal Bahadur Shastri becomes P.M. Communist Party of India splits into right and left—Communist Party of India (CPI) and Communist Party of India—Marxist (CPM). 17th Amendment.

1965: Indo-Pakistan war in the Rann of Kutch. Cease-fire in the Rann (June 30). 1966: Tashkent meeting between Lal Bahadur Shastri and Ayub Khan. Agreement reached. Shastri dies at Tashkent (Jan. 11). Indira Gandhi elected Prime Minister (Jan. 19). Dr. Bhabha dies in a plane accident. C. P. Ramaswamy Iyer dies (July 26). The States of Haryana and Punjab come into being. 18th, 19th and 20th Amendments.

1967: Opinion Poll in Goa. Goa decides to continue as Union Territory. Fourth General Election. Indira Gandhi elected Prime Minister.

Dr. Zakir Hussain elected President. Earthquake at Koyana (Maharashtra). 21st Amendment.

Banks Nationalised. 1969: Madras State changes its name to Tamil Nadu. Zakir Hussain dies (May 3). V. V. Giri becomes Acting President. Nationalisation of 14 leading banks by Presidential Ordinance (July 19). Giri resigns Acting Presidentship to contest the Presidential election. Chief Justice Hidayatulla takes charge as Acting President. Giri elected President (Aug. 20). G. S. Pathak Vice President. Cong. Party splits. Indira Gandhi forms her own Congress Party. Jagjivan Ram President of the Indira Congress. 22nd and 23rd Amendments.

1970: Supreme Court holds nationalisation of banks illegal. Presidential ordinance revalidates nationalisation (Feb. 14). West Bengal Ministry resigns. President takes over the government of West Bengal. State of Meghalaya comes into being (April 2). Kerala Ministry under Achuta Menon resigns. President takes over the government. Privy purses and special privileges of former Indian rulers abolished by Lok Sabha. Uttar Pradesh ministry dismissed. President takes over the government. Dr. C. V. Raman dies (Nov. 21). Supreme Court strikes down the Presidential order (in terms of the Lok Sabha resolution) abolishing privy purses and special rights to princes. President dissolves the Lok Sabha.

Bangladesh Born. 1971: President takes over the government in Orissa. Himachal Pradesh becomes a State (Jan. 25). K. M. Munshi dies (Feb. 8). Indira Congress wins the mid-term elections for Lok Sabha. Indira Gandhi becomes P.M. General Insurance nationalised (May 13). President takes over administration in Punjab. Nationalisation of 214 coal mines in West Bengal and Bihar. Presidential government in Tripura. Indo-Pakistan war begins. Pakistan attacks India in the west (Dec. 3). India recognises Bangladesh. Indian army marches into Bangladesh, joins hands with Mukhti Bahini of Bangladesh. Pakistan army in Bangladesh surrenders to the Indian Commander. Indo-Pak war ends (Dec. 17). 24th, 25th, 26th and 27th Amendments.

1972: Presidential government in Bihar. Manipur, Meghalaya and Tripura become

states of the Indian Union. Arunachal Pradesh and Mizoram become Union Territories (Jan. 20). Presidential government in Manipur and Tripura. Election to State Assemblies (March). Dacoits of Madhya Pradesh surrender to Jaya Prakash Narain (April). Government of India announces increase of minimum bonus to workers from 4% to 8.33% (Sept. 18). Mulki agitation in Andhra Pradesh. P.M. announces in Parliament that Mulki rights (for preference in appointments) will continue for a limited period. C. Rajagopalachari dies (Dec. 28). 28th, 29th and 30th Amendments.

Judges Superseded. 1973: President takes over the government in AP, Orissa and Manipur. Supreme Court endorses the right of the Parliament to amend any part of the constitution, including Fundamental Rights without changing the basic structure. Justice Ajit Nath Ray named Chief Justice of the Supreme Court, superseding the three seniormost judges—J. M. Shelat, K. S. Hegde and A. N. Grover. Justices Shelat, Hegde and Grover resign in protest. Mohan Kumar-amangalam, Central Minister, dies in an air crash near Delhi (May 31). President takes over Govt. in U.P. Prime Minister's 6-point plan for Andhra Pradesh settles the Mulki question. The Sixth Finance Commission submits its report (Oct. 28). Mysore changes its name to Karnataka (Nov. 1). E. V. Ramaswamy Naicker (EVR), founder of the Dravida Kazhagam, dies (Nov. 24). 31st and 32nd Amendments.

1974: President takes over the administration of Pondicherry (Jan 3) and Gujarat (Feb 9). General Elections in Orissa, UP, Manipur and Pondicherry. Jaya Prakash Narain starts 'Citizens for Democracy' movement for cleansing the administration and strengthening democracy. Atomic 'device' exploded at Pokran in Rajasthan (May 18). J. P. Narain leads an agitation for dissolution of the Bihar Assembly. India and Sri Lanka agree on the administration of Kachatheev (island) in Palk Straits. Sri Lanka is to have exclusive jurisdiction over the island (June 27). Compulsory Deposit Scheme announced (July 17). Fakhruddin Ali Ahmed elected President (Aug. 20). B. D. Jatti Vice-President. J.P. leads a popular morcha to the Bihar Legislature. The agitators lathicharged. J.P. suffers injuries. Bihar Bandh complete. Statewide har-

tal observed. Presidential ordinance prohibiting the courts from taking cognisance of detentions under MISA. Sucheta Kripalani dies (Dec. 1). Restoration of diplomatic ties between India and Portugal. 33rd, 34th and 35th Amendments.

Recognises PLO. 1975: L. N. Mishra, Railway Minister, and 22 others hurt in bomb blast at Samastipur Railway Station. L. N. Mishra dies. (Jan. 2). India accords recognition to the Palestine Liberation Organisation (10). Oil struck in third Bombay High (11). Sheikh Abdullah becomes Jammu and Kashmir Chief Minister (24). 'People's March' to Parliament. J.P. presents charter to presiding officers of Parliament. J.P. leads 'People Morcha' to Bihar Vidhan Sabha (March 18). India recognises Sihanouk Government in Cambodia. Sikkim, in referendum, votes for full statehood in India, for abolition of the institution of Chogyal (April 15). Dr. S. Radhakrishnan, former President, dies (Apr. 17).

India ushered into space age: satellite 'Aryabhata' launched from a cosmodrome in Soviet Union (19). Sikkim joins Indian Union as the 22nd State (May 16). Farakka Barrage dedicated to nation (21). Mrs. Indira Gandhi's election set aside by Allahabad High Court (June 12). Justice V. R. Krishna Aiyar of the Supreme Court gives conditional stay of the Allahabad High Court judgement (24). Opposition leaders announce nationwide Satyagraha from June 29 to force Mrs. Gandhi out of office (26).

Emergency. President declares emergency. J.P. and a number of Opposition leaders and dissident Congressmen arrested (26). Prime Minister announces 20-point economic programme. New Ordinances promulgated (July 1). The RSS, Anand Marg, Jamat-i-Islami and 23 other organisations banned.

Parliament approves Conservation of Foreign Exchange and Prevention of Smuggling Activities Act (COFEPOSA). Parliament approves MISA bill. Lok Sabha adopts Election Laws (Amendment) Bill seeking to remove retrospectively certain 'uncertainties and doubts' regarding some provisions of the Representation of the People Act (Aug. 5). Constitution (39th Amendment) Bill 1975, placing election of President, Vice President,

PM and Lok Sabha Speaker beyond the scrutiny of judiciary, approved by Parliament. Rajya Sabha adopts Constitution (41st Amendment) bill extending immunity from criminal and civil proceedings to the Prime Minister.

TV Extended. Calcutta and Madras on TV map of India. Ordinance promulgated for grant of national permits for goods trucks (Sept. 26). Government announces 12-point programme for making Prohibition policy a success (Oct. 1). K. Kamaraj dead (2). New MISA Ordinance prevents courts from enquiring into the grounds for detention of persons (17). 'Bonded' labour abolished by Ordinance (24). P.M.'s election upheld by the Supreme Court (Nov. 7). Naga problem settled (11). President's rule imposed in Uttar Pradesh (30). J.P. set free (Dec. 4). Government assumes special powers to prevent publication of objectionable matter in the press, repeals immunity for press reports of Parliament and abolishes Press Council from New Year day (Jan. 1, 1976). 75th Plenary Session of the Congress opens at Chandigarh. D. K. Barooah elected Congress President (29). 36th, 37th, 38th and 39th Amendments.

Shell Nationalised. 1976: Baliram Bhagat elected Lok Sabha Speaker (Jan. 6). President suspends seven freedoms guaranteed by Article 19(8). President's Rule ends in Uttar Pradesh. Burmah Shell nationalised, becomes Bharat Refineries Limited (24). Lok Sabha passes Prevention of Objectionable Matters Publications Bill. President's rule in Tamil Nadu. India's national news agency "Samachar" launched (Feb. 1). Lok Sabha's life extended by one year (4). Urban Ceilings Act comes into force (17). Gujarat comes under President's rule (March 13). India and Pakistan agree to exchange envoys, and resume overflights, restore air and rail links (May 14). Lok Sabha passes 40th Constitutional Amendment placing 64 Central and States laws above court review (25).

IA Boeing 737 to Bombay via Jaipur hijacked to Lahore, passengers released on September 11. 89 killed in IA plane crash at Bombay airport (Oct. 12). Lok Sabha passes the 42nd Constitution Amendment Bill making India a Socialist Secular Republic and laying down fundamental duties for citizens

(Nov. 2). Lok Sabha votes to extend its own life by another year (5). President's rule in Orissa proclaimed (Dec. 16). England beats India in New Delhi Cricket Test (22). President's Rule lifted in Gujarat (24). 40th, 41st and 42nd Amendments.

1977: The President dissolves Lok Sabha (Jan. 18). Government relaxes rules of Emergency to permit normal political activity and electioneering. Four parties—Congress (O), Jan Sangh, Bharatiya Lok Dal and the Socialist Party—agree to work as one party under the name *Janata Party*. An ordinance amending the Representation of People Act, 1951, promulgated increasing the period of disqualification of persons convicted for any offence from five years to six years. Two ordinances providing for the setting up of two authorities, one to decide disputes about election of the President and the Vice-President and the other about the Prime Minister and Speaker promulgated (Feb. 3).

Notification for Lok Sabha elections. President Fakhruddin Ali Ahmed passes away in New Delhi. B. D. Jatti sworn in Acting President (11). India's second earth station for satellite communication at Dehra Dun inaugurated (25). Polling in the Lok Sabha election starts (Mar. 16). Internal Emergency promulgated on June 25, 1975 withdrawn (21).

Janata in Power. Janata and its allies gain absolute majority in Lok Sabha. Indira Gandhi resigns (22). Ban on RSS and 26 other organisations lifted. A. K. Gopalan, Marxist leader, dies in Trivandrum. The RSS chief Deoras released.

Morarji Desai elected leader of Janata Party and sworn in Prime Minister (24). Sixth Lok Sabha session begins (25). Sanjiva Reddy elected Speaker of the Lok Sabha. Government revokes the external emergency promulgated on December 3, 1971. Governor's rule in Jammu and Kashmir (27). Goa Assembly dissolved (27).

The Acting President B. D. Jatti dissolves the Legislative Assemblies of nine Congress-ruled States, Bihar, Haryana, Himachal Pradesh, M. Pradesh, Orissa, Punjab, Rajasthan, Uttar Pradesh and West Bengal and places them under President's rule. Four Parties—Congress (O) (Old Congress as distinguished from Indira Congress), Jan

Sangh, Bharatiya Lok Dal and Socialist Party—at their separate sessions decide to dissolve themselves and merge into a single party (30). Chandra Shekar chosen President of the Janata Party (May 5).

K. Brahmananda Reddy elected President of the Indian National Congress. The Election Commission recognises the Janata Party as a National Party. Poll notifications for ten States and two Union Territories issued.

Janata gains absolute majority in Haryana, Himachal Pradesh and Rajasthan Assemblies and in Delhi Metropolitan Council. Akali-Janata-CPM alliance wins absolute majority in Punjab. Janata gets absolute majority in Uttar Pradesh, Madhya Pradesh and Orissa. The All-India Anna DMK gets absolute majority in Tamil Nadu. No party gets absolute majority in Pondicherry. Janata gains absolute majority in Bihar. C.P.M. absolute majority in West Bengal. Government decides to discontinue national civilian awards (July 10).

Reddy President. Sanjiva Reddy elected (unopposed) President of India. K. S. Hegde unanimously elected Lok Sabha Speaker (21). The Planning Commission decides to introduce Rolling Plan concept (Sept. 10). Variable energy cyclotron commissioned in Calcutta (15).

Indira Gandhi arrested in New Delhi by the CBI on charges of corruption. Indira Gandhi released unconditionally. The External Affairs Minister A. B. Vajpayee addresses UN General Assembly in Hindi, the first ever. India and Bangladesh formally sign Farakka agreement in Dacca. Tripura comes under President's rule (Nov. 5). The silver jubilee time capsule in the Red Fort dug out (Dec. 8). 43rd Amendment.

1978: Air-India Boeing 747 with 213 persons aboard crashes into the sea off Bombay coast (Jan. 1). "M.V. Chandragupta", bulk carrier of the Shipping Corporation of India, with 69 persons aboard sinks in the Pacific Ocean (6). A Minorities Commission is constituted (15). Currency notes of the denominations of Rs. 1,000, Rs. 5,000 and Rs. 10,000 are demonetised (16).

The Indian National Congress(I) recognised as a national party and allotted the election symbol "hand". Malayalam poet Mahakavi G. Sankara Kurup dies in Trivan-

drum (Feb. 2). Justice Y. V. Chandrachud is sworn in as Chief Justice of India. Swaran Singh is elected Congress President (Mar. 1). The Shah Commission's interim report is submitted to the Government (27). The Government decides to abolish preventive detention (30).

Congress Opposition. The Congress (I) is recognised as the main Opposition and its leader, C. M. Stephen, as leader of the Opposition in the Lok Sabha (April 12). Samachar splits and its four constituents—PTI, UNI, Samachar Bharati and Hindustan Samachar—start functioning separately (14). Ashapura Devi, Bengali Novelist wins 1976 Jnanapith Award (26). A second Press Commission is announced (14). Prime Minister Morarji Desai addresses the special session of the UN General Assembly (June 13). The Karakoram Highway, linking Gilgit in Pakistan-occupied Kashmir with Sinkiang in China, is opened (18).

Patna High Court sets aside the sessions court judgement sentencing the founder-head of the Ananda Marg, P. R. Sarkar, alias Anandamurti, and four others to imprisonment for life (July 4). Mother Teresa is presented with the Order of the British Empire. Justice H. R. A. Ansari is appointed chairman of the reconstituted Minorities Commission (26). The Rajya Sabha passes the MISA Repeal Bill (27). A statutory minimum bonus of 8.33 per cent for workers for the accounting year 1977, regardless of profit, is announced (22). The Shah Commission's final report. The Rajya Sabha returns the Constitution (45th Amendment) Bill to the Lok Sabha after striking down five clauses (31).

Test-tube Baby. A test-tube baby, world's second, is claimed born in Calcutta (Oct. 3). India is unanimously elected Chairman of the UN Disarmament Commission. The Report of the Jagan Mohan Reddy Commission, on the Nagarwala case, is submitted to the Government (23). An IAF plane crashes at Leh killing 77 defence personnel and a civilian (Nov. 19). The Privileges Committee of the Lok Sabha holds Indira Gandhi guilty of breach of privilege and contempt of the Lok Sabha for obstructing Government officials from collecting information for a question on Maruti in 1975 (21).

The Supreme Court declares the Parliament has the legislative competence to create special courts to try cases involving emergency offences (Dec. 1). The Lok Sabha expels Mrs. Indira Gandhi, former Prime Minister, from the House and sentences her to imprisonment for a term to last until its prorogation (19). Indira Gandhi is released from jail (26). 44th Amendment.

Rohini Up. 1979: Rohin-200, first monsoon experimental rocket, launched from Thumba (Jan. 6). Kanpur TV centre commissioned (12). Jnanpith award to S. H. Vatsyayan, Hindi poet and novelist (20). World Sanskrit Conference in Allahabad. The Election Commission declares the Chickmagalur seat in Lok Sabha vacant following the expulsion of Indira Gandhi (30). The Cellular Jail in Andaman and Nicobar declared a national memorial (Feb. 11). Sanjay Gandhi and the former Information and Broadcasting minister V. C. Shukla sentenced to two years in jail for the destruction of the film "Kissa Kursi Ka" (27).

Goa, Diu and Daman under President's rule (April 28). K. P. S. Menon gets Lenin prize (May 1). Cyclone hits coastal Andhra Pradesh—widespread damage to life and property (12). Gupta commission indicts Sanjay Gandhi and others on irregular Maruti deals (31). Soviets launch India's second satellite "Bhaskara" (June 3). The Congress(I) loses main opposition status in the Lok Sabha to the Congress(U). The Congress tables

no-confidence motion against the Janata government (July 11).

Morarji Resigns. Morarji Desai resigns as Prime Minister (15). Jagjivan Ram, elected Janata parliamentary party leader. Charan Singh is Prime Minister heading Janata(S)-Congress coalition and Jagjivan Ram is leader of the opposition in the Lok Sabha (17). M.V. Kairali, the only ship of the Kerala State Shipping Corporation, disappears in Gulf waters. The crew of 51 missing (20). Indian Airlines Avro crashes near Bombay, killing 45. Satellite launch vehicle fails to put 40-kilo payload into earth orbit, plummets into sea (Aug. 10). Damburst floods Morvi and Lilapur in Gujarat. Over 1000 dead (12). President's rule in Sikkim (18). Mrs. Gandhi withdraws support to the Charan Singh government (20). President dissolves Parliament, orders year-end general elections and asks Charan Singh to head a caretaker government (21). M. Hidayatullah, consensus choice of political parties, as Vice-President of India (31). Nizam jewellery declared national treasure. (Sept. 21). Operation (Milk) Flood-II launched (Oct. 2). Jaya Prakash Narayan dies (8). Supreme Court stays the execution of all death sentences. Mother Teresa awarded Nobel Peace Prize (17). Arunachal Assembly dissolved, President's rule (Nov. 3). Manipur under President's rule (14). Capt. Dhyan Chand, Hockey wizard, dies (Dec. 3). Kerala comes under President's rule (12).

90. VICTORY AND MARTYRDOM

The Eighties in modern Indian history will be remembered as an era of victory and martyrdom of Smt. Indira Gandhi. From the depths of ignominy and defeat she made a thunderous comeback through Parliamentary victory which has few parallels in world history. But, the problems that she had to face thereafter were so enormous that she died a martyr in fighting them.

1980: Polling in Seventh General Election ends (Jan. 6). Devaraj Urs, Karnataka Chief Minister, resigns, following reverses in elections (7). Care-taker Prime Minister Charan Singh informs the President of his desire to resign (9). Mrs. Indira Gandhi's Congress (I) wins two-thirds majority in the new Lok Sabha (10).

Gundu Rao sworn in Congress (I) Chief

Minister of Karnataka (12). Mrs. Gandhi's new Ministry at Centre sworn in; R. K. Dorendra Singh Chief Minister of Manipur (14). D. Ramachandran becomes Chief Minister of Pondicherry and Pratap Singh Rane, Chief Minister of Goa (16). Assam agitation turns violent; Army called out; Oil India Manager stoned to death; Gangong Apsong sworn in as Chief Minister of Aru-

nachal Pradesh (18). Assembly elections in Kerala, Left Democratic Front wins absolute majority (21). Haryana's Janata CM Bhajan Lal with 37 MLAs defects to Congress (1), continues as Congress (I) Chief Minister; Balram Jakher elected Lok Sabha Speaker (22).

Nayanar Govt. formed in Kerala (24). Civilian Awards stopped by the Janata Government revived; Mother Teresa awarded Bharat Ratna (30).

Janata Ministry headed by Shanta Kumar in Himachal Pradesh resigns; a Congress (I) ministry headed by Ramlal takes office (14). Total solar eclipse (15). State Assemblies in Tamil Nadu, Maharashtra, U.P., Bihar, Orissa, M.P., Rajasthan, Punjab and Gujarat dissolved, ministries dismissed and President's rule imposed (17). Forty-six defence personnel killed in plane crash in Agra.

C. M. Stephen wins Lok Sabha by-election from Gulbarga Constituency (Feb. 23). Jagjivan Ram resigns as leader of Janata Parliamentary Party (27). C. M. Stephen made Cabinet Minister at Centre; three more Ministers of State added (Mar. 3). Jagjivan Ram "quits" Janata Party; Veerendra Patil made Cabinet Minister for Petroleum and Chemicals; Father Mathew Mannaparambil shot dead in Sasaram (7). C. B. Gupta (79), Janata Party Treasurer and veteran freedom fighter, dies in Delhi (11). Thirty die as boat with over 200 passengers sinks off Cochin (19). Prakash Padukone becomes the first Indian to win All-England Badminton Championship (23).

Janata Splits. Charan Singh, Chairman, expels Raj Narain from Lok Dal; Raj Narain forms a new Janata (S) Party (Apr. 2). Janata Party splits again; members with RSS links form Bharatiya Janata Party with A. B. Bajpayee as President (6). Sanjay Gandhi and V. C. Shukla acquitted by Supreme Court in the *Kissa Kursi Ka* case (11). Six more private sector banks nationalised (15). Jamir sworn in as Nagaland CM. (18). Baba Gurbachan Singh, Nirankari Chief, assassinated; son named new chief (24). Assamese poet Birendra Kumar wins 1979 Jnanpith Award (26). Supreme Court bans handcuffing of prisoners (30).

Sobha, the best actress Award winner, dies at Madras (May 1). Supreme Court rules Parliament has no unlimited power to amend

constitution; court also upholds validity of death sentence (9). Bahuguna quits Congress (I) and resigns from Lok Sabha (20).

AIADMK wins in Tamil Nadu Assembly election; Congress (I) wins in U.P., M.P., Gujarat, Rajasthan, Punjab, Maharashtra and Orissa (June 1). 15 more ministers added to Union Cabinet; Darbara Singh sworn in as Punjab CM and Dr. Jagannath Misra as Bihar CM (8). M. G. Ramachandran's second AIADMK Ministry takes office (9). President's rule in Assam extended for six months by Lok Sabha (10). Sanjay Gandhi appointed Congress General Secretary (13).

Sanjay Killed. Sanjay Gandhi dies in plane crash in New Delhi (June 23). Former President V. V. Giri passes away (24). Oil find off A.P.; Gas near Andamans (26). India recognises Heng Samrin Govt. in Kampuchea (July 7). Congress (I) gets absolute majority in Rajya Sabha (12). India orbits satellite: SLV-3 Rocket puts Rohini satellite in orbit (18). India regains Olympic hockey title (29).

Allahabad High Court dismisses election petition against Mrs. Gandhi (Aug. 12). Kudremukh Project in Karnataka completed (23).

Second Commonwealth Regional Heads of Government Conference in New Delhi (Sep. 4). T. Anjiah becomes Andhra Chief Minister (Oct. 11). Centre nationalises Maruti company (14). Eleven more ministers added to Union Cabinet (19). Union Railway Minister Kamalapati Tripathi resigns (25). President dismisses Tamil Nadu Governor Patwari; Sadiq Ali named successor (26). National Integration Council constituted (Nov. 6). Centre takes over Auroville (12). All members of Railway Board replaced (16). Manipur Chief Minister Dorendra Singh resigns (19). Prince Charles arrives in Delhi (24). Justice Apajee Varadarajan, a Harijan, appointed to Supreme Court (29).

Parliament condemns blinding of under-rials in Bhagalpur; Supreme Court orders enquiry into Bhagalpur blinding; former Railway Minister K. Hanumanthiah dies (Dec. 1). President's rule (imposed on Dec. 12, 1979) in Assam revoked; Mrs. Anwara Tamur heads a new Ministry in Assam (6). Soviet President Leonid Brezhnev arrives in New Delhi (8). 1980 *Jawaharlal Nehru Award* for international understanding for Mrs. Barbara Ward

(23). 1981: World Tamil Conference opens in Madurai (Jan. 4). Mr. B. K. Nehru appointed Governor of Jammu & Kashmir (15). Central Government offers full statehood to Mizoram (17).

Award for 'Akrosh'. India's 'Akrosh' and Bulgaria's 'Unknown Soldier's Patent Leather Shoes' share the Golden Peacock award for the best film at the 8th International Film Festival (Jan. 17). Mr. M. M. Ismail, Chief Justice of Madras High Court, transferred to Kerala and Mr. K. B. N. Singh, Patna High Court Chief Justice, to Madras High Court (19). The Jammu & Kashmir Chief Minister Sheikh Abdullah names son Dr. Farooq Abdullah his successor (23). Third airline feeder service Vayudoot inaugurated (26). Dr. Madhuri Shah appointed Chairman of the University Grants Commission (Feb. 3). Sixty-one die in circus fire in Bangalore (7). Forty-four ministers take office in Andhra Pradesh.

Census operations begin (9). Tamil Nadu and Kerala Governments decide on judicial inquiry into Spirit Scandal (Feb. 11). Fire wrecks Spencer's buildings in Anna Salai in Madras (13). Medicos suspend stir in Gujarat (18). Railway fares and freight to cost 10 to 15 per cent more. M. H. Beg, former Chief Justice of India, named Chairman of the Minorities Commission in succession to Mr. M. A. Ansari (27). Mrs. Gandhi asks the Civil Supplies Minister V. C. Shukla to resign (Mar. 19). Minting of three, two and one paise coins discontinued (20). Tamil Nadu Government relaxes Prohibition (21). Mr. R. K. Vyas, Pondicherry Governor, succeeds Mr. L. P. Singh as Assam Governor (25). The CPI central executive decides to expel its former Chairman, S. A. Dange, for his anti-party activities (29).

Bengali film "Aakaler Sandhane" wins 1980 Swarna Kamal award for best film; Dada Saheb Phalke award for best film goes to P. Jairaj (Apr. 7).

Dange Expelled. S. A. Dange, expelled from the Communist Party of India. The 105-day-old anti-reservation agitation by Gujarat students and junior doctors withdrawn unconditionally (13). 14-day strike by LIC employees called off following Supreme Court orders to the management to make bonus payments within seven days (15). The

Finance Minister R. Venkataraman announces new concessions to export-oriented units (22).

Ministry led by Capt. W. A. Sangma, Congress(I), sworn in Meghalaya (May 8). Y. B. Chavan resigns from Congress(U) (26). More than 15 million hit by drought in Rajasthan (29). SLV-3 puts Rohini in orbit from Sriharikota (31).

General K. V. Krishna Rao assumes charge as the Chief of Army Staff (June 1). Malayalam fiction and travelogue writer S. K. Pottekkal wins the Jnanpith Literary award for 1980, for his autobiographical novel 'Oru Desathinte Katha' (7). Rajiv Gandhi and Begum Abida Ahmed win by-elections from UP constituencies (15). APPLE, India's first geostationary experimental telecommunications satellite is launched into orbit from Kourou, French Guiana. The June 14 polling in the Garhwal Parliamentary constituency in UP is declared void and fresh poll ordered (19). Air Marshal Dillbagh Singh is appointed Chief of Air Staff (24). Assam Chief Minister Mrs. Anwara Taimur resigns (28). President's rule imposed in Assam (30).

Liquor Tragedy. Over 350 die in liquor tragedy in Bangalore and Mysore (July 7). Govt. increases prices of petrol, diesel, kerosene, cooking gas and furnace oil (July 10). Shiv Charan Mathur sworn-in in place of Jagannath Pahadia as Rajasthan Chief Minister (13). Toddy and arrack shops reopened in Madras. India's first three-axis stabilised experimental communication (APPLE) put in its slot (16). Worst deluge in centuries in Rajasthan—Jaipur cut off (19). TV Programme successfully relayed through APPLE (22). Prakash Mehrotra appointed Governor of Assam and Meghalaya and S. M. H. Burney, Governor of Manipur, Tripura and Nagaland (23). Ordinance empowers Central Govt. to ban strikes in any essential service (27).

Jagjivan Ram heads breakaway Congress(U) and calls new party Congress(J) (Aug. 5). Fifty persons given life terms for killing 14 Harijans of Pipra village in Patna district (5). The Governor of Rajasthan, Mr. Raghukul Tilak dismissed (8). Prime Minister Indira Gandhi leaves for African tour. Mr. Sharad Pawar, Maharashtra leader, elected President of Congress(U) (25). Air Chief Marshal Dillbagh Singh succeeds Air Chief Marshal

Latif as Air Chief (30). Lok Sabha Speaker holds no privilege had been breached by the Finance Minister R. Venkataraman's statement on fund collections by the Maharashtra Chief Minister A. R. Antulay (Sept. 7).

Pilgrimage to Tibet. The first batch of 18 members of a pilgrim party leaves for Kailas and Manasarovar in Tibet—the first batch to go there in 20 years. Lala Jagat Narain, veteran journalist and freedom fighter, shot dead in Ludhiana (Sept. 9). B. D. Pande appointed Governor of West Bengal to succeed T. N. Singh who resigned (10). Tamil University inaugurated in Thanjavur (15). Sant Jarnail Singh Bhindranwale arrested in connection with Lala Jagat Narain's murder; violence follows; eight die in police firing (20).

Oil struck in off-shore well in the Cauvery basin 50 km off Vedaranyam coast. Mrs. Indira Gandhi in Fiji (Sept. 25). Five Khalistan activists hijack Indian Airlines Boeing 737 to Pakistan with 117 passengers; 66 freed on arrival in Lahore (29). Pakistan Commandos dressed as cleaners overpower five hijackers of the Indian Airlines Boeing freeing 45 hostages on board in a 28-minute operation. Delhi asks Pakistan to extradite hijackers (30).

Activists of the Dal Khalsa who masterminded the hijacking of Indian Airlines arrested (Oct. 1). Sant Jarnail Singh Bhindranwale released from judicial custody (15). Congress(S) pulls out of ruling Marxist-led Left Democratic Front in Kerala. Bombay High Court freezes funds of the Indira Prastha Prathisthan and the Konkan Unnati Mitra Mandal (16).

Nayanar Resigns. Twenty-one-month-old Left United Front Ministry led by Mr. E. K. Nayanar, resigns in Kerala (Oct. 20). Kerala under Central rule (21).

PM back in Delhi after attending the Cancun summit (28). Experimental TV station inaugurated in Bangalore (Nov. 1). Supreme Court stays all executions in the country pending disposal of petition challenging the validity of death penalty. Sofia University (Bulgaria) honours Mrs. Gandhi (7). Mrs. Gandhi in Italy; delivers McDougall lecture at FAO; meets Pope (9).

IMF board clears 5 billion SDR loan for

India (Nov. 10). Mrs. Gandhi in Paris. France offers easy credit to buy Mirage Fighters. 1981 Nehru Award for Prof. and Mrs. Gunnar Myrdal (12). Vice Admiral Dawson named new Chief of Naval Staff (18). Bhaskara is launched from Soviet Cosmodrome (20). Sri Krishna Deva Raya University inaugurated in Anantapur (22). Air India plane hijacked from Seychelles; crew, passengers freed in Durban, S. Africa, where plane lands. Hijacking done by mercenary force sent to topple the government in Seychelles.

Qutub Minar Tragedy. Forty-five people, majority of them children, killed in a stampede in Qutub Minar, Delhi (Dec. 5). Ry. freight rates raised by 10 to 15 per cent. India-China talks open in Beijing (10). Jatendar Santokh Singh, President of Delhi Gurdwara Prabhandak Committee, shot dead; assassin also shot dead by bodyguard (21). Congress(S) unit in Kerala defies national leadership and decides to join Ministry headed by Congress(I) (23). New Madras-Penang undersea cable commissioned.

Parliament votes to restore the original character of the Aligarh Muslim University (Dec. 24). President's rule revoked and a new Government led by the Congress(I) leader Karunakaran, installed in Kerala. Supreme Court upholds law for detention without trial but lays down guidelines (28). Congress(I) loses nine of 29 seats in elections to the Andhra Pradesh Legislative Council, and the by-election to the Lok Sabha from Sagar in Madhya Pradesh; wins the Kosta (MP) Assembly seat (29). Supreme Court holds transfer of judges valid.

1982: Firing on Assam agitators—four killed. Film actor David Abraham dies in Toronto (Jan. 1). Mrs. Anwara Taimur, former Assam Chief Minister, resigns as Congress Legislature Party leader (9).

Indians in Antarctica. 21-member Indian team lands on Antarctica. Industrialist B. M. Birla passes away (Jan. 1). Bombay High Court finds allegations against the Chief Minister A. R. Antulay justified. Antulay resigns. Jyotirmoy Bosu (CPI(M) M.P. dies in Jaipur (12). K. C. Gogoi sworn in as Assam Chief Minister (13). Prime Minister reshuffles cabinet. Pranab Mukherjee gets Finance portfolio; Defence for R. Venkataraman (15). 30 feared drowned as country boat capsizes

in Sasthamcottah Lake near Quilon (16).

Bombay textile workers go on strike (Jan. 18). Babasaheb Bhosale chosen Maharashtra Chief Minister. Mizo National Front and allied organisations declared illegal by Government (19). 14-member Assam Ministry sworn in (22). Telephones celebrate centenary (24). Mohan Lal Sukhadia, former Chief Minister of Rajasthan, dies (26). Sixty-three killed when the Hyderabad-Delhi Dakshin Express and a goods train collide head-on near Delhi (27). Seven-member delegation led by Agha Shahi arrives in Delhi for Indo-Pakistan talks on a no-war pact. Bihar Govt. suspends 40 police and medical officers in the Bhagalpur blinding case (29). Billa and Ranga hanged for the murder of the Chopra children (31).

Kerala Speaker A. P. Kurian of the CPI(M) and the Deputy Speaker, M. J. Zakaria Sait (AIML) resign and join Opposition. A. C. Jose takes over as Speaker (Feb. 1). Statue of Bahubali consecrated at Dharmastala (3). Kerala UDF Ministry headed by K. Karunakaran survives no-confidence motion (4). Anjiah announces decision to quit as AP Chief Minister (16). Lok Dal & Democratic Socialist Party boycott President's address to the joint session of Parliament. Sivaji Ganesan, Tamil film actor, nominated to Rajya Sabha (19). B. Venkataram to succeed Anjiah as Andhra Pradesh Chief Minister (22).

Massive Taxes. Central Budget: Massive tax effort to raise Rs. 590 crores. Air Chief Marshal H. Latif appointed Maharashtra Governor. Admiral Dawson takes over as Chief of Naval Staff (March 1). Press Council reconstituted. Kerala Congress Mani group member withdraws support: Crisis in Government (15). President's rule in Kerala (17). President's rule in Assam also: Assembly dissolved. Acharya J. B. Kripalani (94) dead (19).

N. T. Rama Rao, film artist, forms new party Telugu Desam in Andhra Pradesh (21). Prof. K. M. Chandy appointed Pondicherry Lt. Governor (22). Rajya Sabha biennial election: Congress(I) wins all the seats in Karnataka, Left front wins in Bengal (27). The first Indian-assembled Jaguar aircraft by HAL, Bangalore, test-flown (31). Record output of oil from Bombay High (Apr. 9).

INSAT in Orbit. India's satellite INSAT-1A placed in orbit; Snag detected

(Apr. 10). Jnanpith award for Amrita Preetham, Punjabi writer (11). Dr. Chenna Reddy appointed Punjab Governor (12). Narayanaswami Naidu, President of Tamil Nadu Agriculturists Association, arrested for defying ban order in Madras (17).

Haryana and Himachal Pradesh Assemblies dissolved (19). INSAT-1A moves to parking slot (21). President inaugurates centenary celebrations of the erstwhile Mysore Representative Assembly (23). Karnataka PCC(S) led by Devaraj Urs severs link with parent body, the AICC(S), and forms a regional party (28). Mrs. Accamma Varkey (73), freedom fighter and Cong. MLA in former Travancore-Cochin Assembly, dies (May 5). Karnataka Kranti Ranga led by Devaraj Urs comes into being (10). Banking department in Ministry of Finance revived (13). Elections for Assemblies held in West Bengal, Haryana, Himachal Pradesh and Kerala.

Basu Bengal C.M. Jyoti Basu is West Bengal CM, Karunakaran in Kerala, Bhajan Lal in Haryana and Ram Lal in H.P. (May 19). Congress(I) Front wins in Kerala (20). Bengal Left Front gets absolute majority (21). H. N. Bahuguna re-elected to Lok Sabha from Garhwal constituency (22). Bhajan Lal sworn in Haryana Chief Minister (23). Cabinet approves Defence Minister's recommendation to set up the proposed Naval Academy at Ezhimala, Kerala (29).

First Secretary of Kuwait Embassy in India, Mustafa-al-Marzook, shot dead by a 30-year-old foreigner in South Delhi (June 4). Delhi police seek interpol aid to probe the killing of Mustafa-al-Marzook. Oil production in Bombay High offshore oilfields registers record level of 251,000 barrels (5). D. Devaraj Urs, former Karnataka Chief Minister, dies (6). Division Bench of the Bombay High Court dismisses appeal filed by former Maharashtra Chief Minister A. R. Antulay against the finding holding Antulay guilty of arbitrary allotment of cement (10).

Congress(I) high command directs Antulay former Chief Minister of Maharashtra to resign as chairman of the Indira Gandhi Pratibha Prathusthan (14). R. K. Trivedi, Central Vigilance Commissioner, new Chief Election Commissioner (16). 19 persons killed and 25 injured in an Air India Boeing 707 from Singapore via Madras crash at Bombay.

Justice H. R. Khanna, former judge of the Supreme Court, Opposition nominee for presidency (22). Unanimous vote in Karnataka legislature, Kannada to be sole first language (24).

Oil in Godavari. Good deposit of oil struck at Enuguvani Lanka in Razole structure of Godavari onshore (June 27). U.P. Chief Minister, V. P. Singh resigns reacting sharply to massacre of 16 villagers, by dacoit gang. MGR inaugurates Tamil Nadu's nutritious noon meal programme benefitting an estimated 63 lakh poor children (July 1). S. Bangarapa (Cong. I) MLA and former PCC(I) President, quits ruling party (6). Israeli consul in Bombay, Yosef Haseen, expelled from India.

Katherine Mary Hellman (82), a close associate of Mahatma Gandhi and popularly known as Sarla Behn, dies (July 8). Cong. (I) candidate Zail Singh declared elected President (15). New UP ministry headed by Sripat Mishra sworn in. 10 Indians fly home to freedom after eight years in Pakistani jails. Mira Behn (90), disciple of Mahatma Gandhi, dies (20). Zail Singh sworn in President (25). Petroleum Minister P. Shiva Shanker tells Parliament that the controversial Kuo Oil deal file was 'misaid' by the Special Assistant to the Prime Minister (28). Manibhai Bhimbai Desai wins Magsaysay Award for Public Service for 1982 (31). Indian Air Force sets up panel of eight to ten ace pilots to participate in an Indo-Soviet Space flight (August 1).

Fire in Bombay High. Fire breaks out in the Bombay High offshore oil well where a blow-out occurred a few days earlier (Aug. 2). Indian Airlines Boeing 737, from New Delhi on its scheduled flight to Srinagar hijacked; drama ends four hours later with the hijacker Gurbax Singh, suspected to be a Khalistan supporter, being overpowered, all passengers safe.

Chand Prasad Bhatt, Indian environmentalist, gets Magsaysay Award for Community Leadership (Aug. 4). Bombay High oil well fire off. S. K. Pottekkat, (69), writer, Jnanpith Award winner and former M.P. dies (6).

Manmohan Singh, Member Secretary, Planning Commission, appointed Governor of Reserve Bank (Aug. 10). Arun Shourie, named for the 1982 Magsaysay Award for journalism, literature and creative com-

munication arts (12). Investment of Rs. 269 crore with a foreign exchange component of Rs. 89 crore, approved for the Maruti project in collaboration with Suzuki Motor Company of Japan (17). The Jammu and Kashmir Governor B. K. Nehru accepts resignation of G. M. Shah, the State's Works and Power Minister and son-in-law of the Chief Minister Sheikh Abdullah (18).

Vypeen Tragedy. Sixty die after consuming adulterated liquor at Vypeen island in Cochin (Sept. 4). INSAT-1A turned off as it is "beyond redemption" (5). Jammu and Kashmir Chief Minister Sheikh Abdullah (77) dies (7). Oil struck in Porto Novo, 40 km from Pondicherry (8). Earth stations at Delhi, Madras, Port Blair, Aizawl and Leh put into operation through Intelsat (10). Malayalam film, 'Oridathoru Phayalwan' bags best film award in Asian film festival (15). The Karnataka Vigilance Commission detects 11 cases of students securing admissions to engineering colleges in the merit pool by altering marks cards and other malpractices (18).

President refers J & K Resettlement Bill to Supreme Court (Oct. 5). India and Bangladesh decide on a two-year extension of the Farakka agreement of 1977. India leases Tin Bigha to Bangladesh, the sovereignty resting with India (7). The Air Force celebrates 50 years (8). H. V. Kamath, freedom fighter and parliamentarian, dies (9). Union Government announces cut in customs duty on imported colour TV sets (11).

JRD's Flying Feat J. R. D. Tata, father of Indian civil aviation, pilots the De Havilland Leopard Moth from Karachi to Bombay—a feat he performed 50 years ago (Oct. 15). Journalists and non-journalists from all over the country stage a march to Parliament demanding withdrawal of the Bihar 'anti-press' Bill (21). Gandhiji's private secretary Pyare Lal dies (27).

Gen. Zia-ul-Haq of Pakistan in New Delhi. Agreement to set up a joint commission. Ravi L. Kirloskar, (65) industrialist, dies (Nov. 4). C. Narayana Pillai (80), freedom fighter, writer, journalist and former MP dies in Trivandrum (14). Acharya Vinobha Bhave (88) dies (15). Diplomat K. P. S. Menon (84) dies (21).

Bihar Government decides to amend the controversial Press Bill (Dec. 7). Union Gov-

ernment decides to cancel visit of three-member delegation to China to take part in Kotnis memorial function, following insinuations that India has misused Asiad forum (11).

Congress led by A. K. Antony merges with Congress-I in Mrs. Gandhi's presence (13). Manoranjan Guha, journalist and freedom fighter, dies (16).

India-Pak Commission. India and Pakistan agree to set up ministerial level joint commission (23). Cold wave in Bihar, over 50 persons die (28). Police and Nabi-Day processionists clash at Alleppey in Kerala. One killed in police firing (20). The 114-year-old English daily, the Madras Mail, ceases publication.

1983: Prof. Satish Dhawan, Chairman, Space Commission and Secretary Department of Space awarded the Aryabhata medal for 1983 (Jan. 2). Telugu Desam sweeps to power in Andhra Pradesh; Janata-led front, ahead in Karnataka; CPI (M)-led four-party left front secures absolute majority in Tripura (Jan. 6).

Janata Party President Mr. Chandra Shekhar starts on his *Bharat Yatra* on foot from the Gandhi Mandapam in Kanyakumari (Jan. 6). Mr. N. T. Rama Rao takes oath as Chief Minister of Andhra Pradesh (8). Eight-member Janata Party Ministry, headed by Mr. Ramakrishna Hegde, takes office in Karnataka. Year-long celebrations of Subramania Bharati birth centenary comes to formal conclusion (10). Notification issued to set in motion the process of electing a 126-member Assam Assembly and 12 members to the Lok Sabha from the State (12).

Bhave Bharat Ratna. After a break of two years Bharat Ratna awarded to late Sarvodaya leader Acharya Vinoba Bhave (Jan. 25). P.M. reconstitutes cabinet by appointing two new Cabinet Ministers and five Ministers of State. Piloo Mody (57), politician, dies in Delhi (29). Minister for Shipping and Transport, Mr. C. M. Stephen, resigns to become Cong. (I) secretary. Governor of A.P. promulgates ordinance banning collection of capitation fee (30).

Vasantrao Patil to succeed Babasaheb Bhosale as Maharashtra's Chief Minister. Mr. Vasantrao Patil sworn in Chief Minister of Maharashtra (Feb. 2). A.P. Government staff-

retirement age reduced to 55. The Chairman of the Railway Board M. S. Gujral's services terminated.

P.M. drops Communications Minister Mr. A. P. Sharma and Civil Supplies Minister Mr. B. N. Singh from the Cabinet. Govt. announces hike in kerosene, HSD prices (Feb. 14). Governor of Himachal Pradesh, Mr. A. N. Banerji, appointed Karnataka Governor. Oil struck off Andhra Pradesh coast. C. K. Daphtary, former Solicitor-General and Attorney-General, dies (16). P. C. Ghosh, former Chief Minister of West Bengal, dies (18). Army alert in Assam as 250 die in Nowgong district town (19).

Cong. (I) wins two-thirds majority in Assam. Meghalaya Cong. (I) stakes claim for power (Feb. 23). Hiteswar Saikia heads new Assam Cong. Ministry. Playwright Tennessee Williams (71) dies (25). Govt. accepts Akalis' religious demands. 13-member Cong. (I) Ministry assumes office in Assam. New levies in Central budget to net Rs. 716 crore. (28).

Army inducted in all seven districts of Assam under provisions of Disturbed Areas Act. President Mr. Zail Singh rejects Akali Dal's demand for resignation (March 2).

Four southern Chief Ministers, all non-Congress (I) parties, form forum for tackling common problems and for seeking drastic changes in Centre-State relations (Mar. 20). Second Indian Antarctica expedition returns. Dharamsey Mulraj Khatau (82), doyen among industrialists, dies (21). Mrs. Indira Gandhi announces appointment of one-man commission, headed by retired Supreme Court Judge Mr. Justice R. S. Sarkaria, to go into Centre-State relations (24). West Bengal unit of Congress (S) headed by Mr. Priya Ranjan Das Munshi merges with Congress (I).

New Oil Found. ONGC strikes oil off Bombay coast (April 1). Cong (I)-led Meghalaya Democratic Front assumes office in Meghalaya. Chief Ministers conference in New Delhi endorses 20-point plan. T. Nadu drought. Krishna water to be brought by rail (4). Gen. J. N. Chaudhar: (75), former Chief of Army Staff, dies (6). Virbhadra Singh elected Himachal Pradesh Chief Minister (8).

"Gandhi" (film) wins 8 Oscars (Apr. 12). Akali Dal launches "army of 100,000 volunteers" as "sacrifice force" (14). SLV-3 laun-

ched. Rohini put in orbit (17). Agreement for a Rs. 700-crore scheme to bring Krishna water to Madras signed (19). 40 feared dead in bus disaster in Idukki district in Kerala (21). First bone-marrow transplant in India at the Tata Memorial Hospital in Bombay (23).

Mathura Oil Refinery inaugurated (May 4). Karnataka Chief Minister Mr. Ramakrishna Hegde wins Assembly seat from Kanakapura (16). Cong. (I) retains MP Assembly seats in by-election; Big margin for Cong. (I) in Porbandar; For the first time, AIR, Madras organises a tele-conference with people travelling by land, sea and air enabling them to talk among themselves (17). Prime Minister Mrs. Indira Gandhi inaugurates work on the Krishna water supply (Telugu Ganga) project for Madras (25).

Gen. A. S. Vaidya, GOC-in-C Eastern Command, appointed new Chief of Army Staff (May 31). Morarji Desai denies having been a CIA agent (June 2). Nearly 65 per cent of over 31-lakh people vote in seventh general elections for the 76 Assembly seats in Jammu and Kashmir (5). Ruling National Conference wins in Kashmir (6). G. D. Birla (89), doyen of Indian industry, dies in London (11).

Farooq CM. Dr. Farooq Abdullah sworn in Chief Minister of Jammu and Kashmir (June 12). Congress (I) withdraws support to DMK in Pondicherry coalition (22). Pondicherry under President's rule; Assembly dissolved. On the penultimate day of 4000 km Bharat Yatra, Janata President Chandrasekhar enters Union Territory of Delhi (24).

First 235 MW unit of nuclear power station at Kalpakkam goes critical (July 2). Maharashtra Chief Minister. Vasantdada Patil elected to State Assembly from Sangli Constituency (4). Union Cabinet approves special plan for expansion of television network envisaging installation of 112 low power and 13 high power additional transmitters by end of 1984 (6). Karnataka Ordinance for abolition of capitation fee in medical and engineering colleges in the State promulgated (11). Former Chief Minister of Himachal Pradesh Ram Lal appointed Governor of Andhra Pradesh (13). Mahadevi Verma, 76-year-old Hindi poetess, selected for Bharatiya Jnanpith award for 1982 (24).

One-day bandh in Tamil Nadu, called by the State Government and backed by Central Government in cooperation with all political parties and trade unions to protest against killings of Tamils in Sri Lanka, goes off peacefully (Aug. 2). 19-day-old strike of Government employees in Andhra Pradesh called off (3). Dr. Raja Ramanna, Director of Bhabha Atomic Research Centre, appointed Chairman of Atomic Energy Commission and Secretary of Department of Atomic Energy in succession of Dr. H. N. Sethna (6). Lok Dal and Bharatiya Janata Party form national democratic alliance" (8).

Karunanidhi Resigns. DMK President, Mr. M. Karunanidhi and General Secretary Mr. K. Anbazhagan resign from Tamil Nadu Assembly on Sri Lanka Tamils issue; Bihar Chief Minister, Dr. Jagannath replaced by Union Minister of State for Energy Mr. Chandrasekhar Singh (10). TULF leader Mr. A. Amrithalingam in Delhi meets Prime Minister (14).

Customs and excise duty reductions, amounting to about Rs. 98 crore on electronic items in a full year, announced (June 19). Mr. Justice V. M. Khalid of Kerala High Court to be Chief Justice of Jammu and Kashmir High Court (22). Four ministers of Karunakaran Cabinet tender resignation (26). Indian scientists successfully deploy vital C-band antenna and partially open solar array of the Indian satellite INSAT-1B; (31).

Kona Prabhakara Rao, sworn in Lieutenant-Governor, Pondicherry (Sept. 2). INSAT-1B runs into snag, as solar array fails to deploy fully (4). India conferred consultative membership of Antarctica Treaty; Over 100 killed, 98 injured, as multi-storeyed building under construction collapses in Majestic area, Bangalore (12).

INSAT set Right. INSAT-1B overcomes hurdles, successfully completes all deployment manoeuvres, including solar sail (Sept. 14). INSAT-1B successfully pushed into its (nominal) position in its space home (18). APPLE, India's first experimental communication satellite, ends mission after remaining in space for two years and three months (20).

Supreme Court upholds execution of criminals through hanging by rope (Sept. 23).

Mohammad Koya, (56), Dy. Chief Minister, Kerala, dies in Hyderabad (28). Indo-Bangla talks begin, satisfaction expressed over implementation of the existing protocol on inland water transport and trade between the two countries (29). The summit of some 22 countries from the West, East and the non-aligned group ends (30).

G. M. Shah, brother-in-law of the Jammu and Kashmir Chief Minister Dr. Farooq Abdullah and seven senior colleagues expelled from the ruling National Conference (Oct. 4). Cyclone hits Andhra Coast; kills 17; Opposition leaders begin conclave in Srinagar (5). Punjab under President's rule; Squadron leader Rakesh Sharma, an IAF test pilot, selected to go into space (6). The Governor of West Bengal, B. D. Pande, appointed Governor of Punjab.

The first ever trans-Himalayan motor expedition concludes (Oct. 8). Ravi Varma Thampuran (92), senior-most member of the Cochin royal family dies in Ernakulam (12). China makes fresh territorial claims in the north-eastern sector of Bhutan (14). The Union Government takes over management of 13 textile undertakings in Bombay; marathon strike in cotton textile industry ends (19).

The Union Government decides to reduce the upper age limit for the Civil Service examinations from 28 to 26 (Oct. 22). Avukaderkutti Naha sworn in Deputy Chief Minister of Kerala (24). Four condemned young men in the Joshi-Abyankar multiple murder hanged to death at the Yeravada Central prison (25).

No to Silent Valley. On the basis of the Menon Committee report the Prime Minister decides not to give clearance for the Silent Valley hydro-electric project (Oct. 27). The Akali Dal President Harchand Singh Longowal rejects Mrs. Indira Gandhi's plea for talks on the basis suggested by her. The fourth round of the Sino-Indian talks concludes (30).

Lakshmi Devadas Gandhi (71), youngest daughter of Rajaji and daughter-in-law of Gandhiji, dies (Nov. 9). In Bombay INS Godavari, first frigate fully designed by Indian Navy and built at Mazgaon, commissioned (Dec. 10). No-trust motion against Cong. (I)-led coalition Ministry rejected in

Kerala Assembly (20). Third Indian expedition lands on Antarctica (27).

1984: Akali Dal (L) President Harchand Singh Longowal, rejects Home Minister P. C. Sethi's offer to refer Chandigarh and Abohar-Fazilka issues to the Supreme Court. Coconut oil prices reach all time high of Rs. 38 per Kg in Kerala (Jan. 2). 71st Session of Indian Science Congress in tribal town of Mesra in Ranchi, Bihar. Filmotsav 84 opens in New Delhi (3).

Posts of Village Officers abolished in Andhra Pradesh (Jan. 5). Andhra abolishes land revenue tax. Attempt on life on CM Rama Rao (9). C. M. Stephen, Congress(I) General Secretary, dies (16). One-year-old Janata Government in Karnataka, headed by Mr. Ramakrishna Hegde, wins confidence vote (17).

"Kashmir Liberation Army" kidnaps Indian Assistant High Commissioner in Birmingham, Mr. R. H. Mahtre, who is later killed (Feb. 4). Mohammed Maqbool Butt, (50), of Kashmir Liberation front executed in Tihar Jail, Delhi (11). Prime Minister Indira Gandhi, leaves for Moscow to attend the funeral of Soviet leader Yuri Andropov (13). Prime Minister Indira Gandhi dedicates INSAT I system to the nation (26). Akali leaders burn copies of Article 25 of the Constitution at a Gurudwara in Delhi (27).

Teresa University. Mother Teresa University inaugurated by Mother herself at Kodaikanal, T. Nadu (Mar. 2). Punjab Govt. deploys para-military forces and police with wide powers (4).

Chandra Sekhar elected President of Janata Party for third term (Mar. 6). Controversial Bihar Press Bill withdrawn (7). Aviation fuel tank blows up at the Cochin Refineries leading to devastating fire (8). Agreement signed between India and Burma for delimiting the maritime boundary (14). Tamil Nadu Government decides to introduce an entrance test for admission to engineering and medical colleges (15). Three lakh port and dock workers strike paralysing 10 major ports (16). Private sector allowed to manufacture telecommunication, switching and transmission equipment (23).

57-km-long pipeline to carry milk installed by Kaira district milk producers union between Navagam and Anand in Gujarat (24).

Lt. Governor of Delhi, Jagmohan, appointed Governor of Jammu and Kashmir in place of B. K. Nehru, shifted to Gujarat (26).

Andhra Legislative Council and Supreme Court on collision course with the former ignoring a court directive and asking the Hyderabad police chief to arrest and produce the Chief Editor of *Eenadu* (Mar. 27). DMK President M. Karunanidhi, among seven candidates elected to Tamil Nadu Legislative Council in biennial elections; A.P. Council prorogued; motion against *Eenadu* Editor lapses (30).

Jammu and Kashmir Assembly adjourned sine die following walkout by Congress(I) members (Apr. 2). Squadron leader Rakesh Sharma became India's first spaceman, when he was launched aboard Soyuz T-11 spaceship from Baikonur cosmodrome in Kazakhstan along with two Soviet cosmonauts (5).

Punjab MP Killed. Terrorists in Chandigarh kill Congress(I) MP from Punjab Mr. V. N. Tiwari; National Security Act made more stringent through an Ordinance, in its application to Punjab and Chandigarh (Apr. 5). First hang glider expedition with four army officers and a jawan from Kashmir to Kanyakumari flagged off (7).

Lalith Athulathmudali, Sri Lankan National Security Minister, in New Delhi for talks (Apr. 12). Kerala Government decides to drop Silent Valley Project and declare the entire area a national park (13). Rama Rao Adik, Deputy Chief Minister of Maharashtra quits office (18). Tirumalai-Tirupati Devasthanams celebrate Golden Jubilee; Chief Minister Mr. N. T. Rama Rao announces plan to develop Tirupati on the lines of Vatican (22).

IAF Officer, Squadron Leader Paramjit Singh Ahluwalia, hacked to death in Ferozepore (Apr. 23). Tamil Nadu Assembly passes Bill to repeal the Anti-Scurrilous Writing Act. Congress(I) voted to power in Mizoram (29).

Tamil Nadu Government extends noon-meal scheme to 63,000 pensioners (May 1). Prime Minister Indira Gandhi and Nakasone, Prime Minister of Japan, hold talks in New Delhi (4).

Phu Dorjee's Feat. Phu Dorjee conquers Mount Everest without oxygen—a

rare feat (9). Giani Pratap Singh, aged former head priest of the Akal Takht, shot dead by intruders in his house in Amritsar (10). Government withdraws cases registered against Akali Dal members for defacing the Constitution; Arrested leaders freed.

Sikkim Government headed by Narbahadur Bandari dismissed; Mr. B. B. Gurung, State's Finance Minister, sworn in Chief Minister; Bronze bust of mathematician Srinivasa Ramanujan unveiled at the Madras University (Mar. 11). Ramesh Chandra Chopra, editor-in-chief of the *Hind Samachar* group of newspapers shot dead by extremists in Punjab. Mr. George Bush, the U.S. Vice-President, in Delhi; Mr. M. A. Muthiah Chettiar, (79), Pro-Chancellor, Annamalai University, dies (12).

Congress(I) attains absolute majority in Meghalaya (Mar. 22). Miss Bachendri Pal becomes first Indian woman to conquer Everest (23). Centre takes over administration in Sikkim; State Assembly dissolved (25). Dr. Bruno Kreisky, former Chancellor of Austria and Dr. Leopold Sedar Senghor, former president of Senegal given the Jawaharlal Nehru Award for International Understanding for 1983 and 1982 respectively (28).

Operation Blue Star. Army takes control in Punjab to stem terrorist violence. The State declared a restricted area under the Foreigners Act (June 2). Curfew throughout Punjab; Movement of vehicular traffic prohibited; Ban on media coverage (3). **Operation Blue Star:** Army closes in on the Golden Temple where an estimated 300 extremists were entrenched. Heavy exchange of fire with extremists using mortar and MMGs (5). Army forces flush out terrorists in Golden Temple and other religious places; Over 325 killed on both sides and several hundreds injured; Terrorists breach an embankment of the Bhakra canal about 2 km from Ropar (6).

The bodies of Jarnail Singh Bhindranwale and Bhai Amrik Singh, President of the banned Sikh Students Federation, found in the basement of the Akal Takht in the Golden Temple; Violence in Delhi, Snnagar; Mr. Zail Singh visits Golden Temple (June 7). Army called out in Jammu, indefinite curfew imposed and shoot-at-sight orders issued (8). Britain apologises to Indira for BBC interview

with Dr. Jagjit Singh Chohan (15). Most Gurudwaras thrown open in Punjab (21); Longowal released, arrested again; Former Maharashtra CM A. R. Antulay resigns from Indira Gandhi Pratibha Prathishtan (22).

PM visits Golden Temple, meets head priests (23). Jnanpith Award for Masti Venkatesh Iyengar (June 24). Curfew in Hubli after violence; Golden Temple thrown open to devotees (25). Punjab Governor B. D. Pande and police chief Mr. P. S. Bhinder resign. K. T. Satarawala appointed new Governor (29).

Sri Lanka Talks. The Prime Minister, Mrs. Indira Gandhi, and the President of Sri Lanka, Mr. J. R. Jayewardene, hold talks in New Delhi; Air Marshal L. M. Katre appointed Chief of Air Staff (July 1). Farooq Abdullah's Ministry dismissed in Srinagar and G. M. Shah sworn in Chief Minister with Congress(I) support; Bombay records century's second highest rainfall (2). IA Airbus hijacked, lands in Lahore (5). Pro-Bhindranwale Sikh terrorist hijackers surrender; hostages return home (6).

White Paper on Punjab released by Union Government (July 10). Four non-Congress(I) Chief Ministers—N. T. Rama Rao, Ramakrishna Hegde, Nripen Chakroborty and Jyoti Basu—walk out of the National Development Council meeting in protest against the dismissal of Farooq Abdullah (July 13). N. T. Rama Rao leaves for New York for medical treatment (16). Baba Santa Singh, Chief of the Nihang Budha Dal, begins kar seva (voluntary repair operation) of the Golden Temple complex at Amritsar.

External Affairs Minister, P. V. Narasimha Rao, appointed Home Minister in place of P. C. Sethi given the Planning portfolio in place of S. B. Chavan designated Minister without portfolio (July 19). Terrorists breach Bhakra canal in Punjab (21). High priests excommunicate Santa Singh (22). Two Karnataka Ministers, Mrs. Chandraprabha Urs (Social Welfare) and Mr. Aziz Sait (Labour), resign from the Ramakrishna Hegde Ministry; Golden Temple at Amritsar reopened to pilgrims (27). Five stabbed in communal clashes at Hyderabad (29).

Madras Airport Blast. N. D. Tiwan replaces Mr. Sripat Mishra as UP CM (August 1). Bomb explosion at Meenambakkam

Airport kills 8. S. B. Chavan, Minister without portfolio made Defence Minister (2); Death toll in Madras airport explosion rises to 32 (3). Two Sri Lankans among five arrested for the bomb blast at Madras airport; Sarbat Khalsa convention in Amritsar "excommunicates" SGPC chief, G. S. Tohra (11). The five Sikh priests reject decisions of the Sarbat Khalsa convention and announce a world Sikh conference on September 2 (12). N. Bhaskara Rao, Finance Minister, dropped from Chief Minister Rama Rao's cabinet in AP and three other ministers resign; A. P. Sharma resigns as Governor of West Bengal (14).

N. T. Rama Rao's Ministry dismissed by Governor in Andhra Ramlal and Bhaskara Rao sworn in Chief Minister (Aug. 16). 71 dead and 104 injured when the Jabalpur-Gondia passenger train plunges into a flooded rivulet; Andhra observes total bandh to protest against the dismissal of Rama Rao Ministry; Ten persons killed and nineteen injured as police open fire in Anantapur district to disperse violent mobs (17). Trouble spreads to more towns in A.P. as bandh is observed for the second day in succession to protest against the dismissal of Rama Rao (Aug. 18).

MLA Parade. Rama Rao parades 162 MLAs before President Zail Singh; A. P. Sharma elected to Rajya Sabha (21). R. Venkataraman elected eighth Vice-President of India (22).

MLAs supporting N. T. Rama Rao, seek refuge in Bangalore before returning for a meeting of the Andhra Assembly; Indian Army patrol opens fire in the Kargil sector of Ladakh, killing a number of armed Pakistani combatants infiltrating across the line of actual control (23).

Ramlal resigns as A.P. Governor; Indian Airlines Boeing 737 with 68 passengers and a crew of 6 hijacked to Lahore; Karnataka Governor issues orders raising the age of superannuation of Govt. servants from 55 to 58 (Aug. 24). The twelve Sikh hijackers of the Indian Airlines Boeing 737 surrender to authorities in the UAE and release all 68 passengers and 6 crew members, unharmed (25). Dr. Shankar Dayal Sharma appointed Andhra Governor (26).

World Sikh Convention at Amritsar adopts resolution excommunicating President Zail

Singh (Sept. 2). Tamil Nadu Food Minister, S. D. Somasundaram, dismissed from State Cabinet. Prof. U. R. Rao, Director of ISRO Satellite Centre, appointed chairman of Space Commission (10).

A.P. Assembly meets and adjourns in two minutes (Sept. 11). A.P. Assembly meets: *Pro-tem* speaker Banga Reddi resigns. New *Pro-tem* Speaker is Sultan Salahuddin Owaisi (13). Bhaskara Rao resigns as Chief Minister of Andhra on Governor's demand. N. T. Rama Rao, back as Chief Minister, asked to prove majority in a month. (16).

NTR Back. N. T. Rama Rao proves majority in Assembly (Sept. 20). Army withdraws from the Golden Temple; Repair of the Akal Takht complete (25). President Giani Zail Singh exonerated by Sikh highpriests (26). The Golden Temple handed over to Sikh highpriests and through them to the SGPC (29).

Pro-Bhindranwale extremists who temporarily took control of Akal Takht ousted by security forces; Vice Admiral R. H. Tahiliani appointed Chief of Naval Staff (Oct. 1). Unilateral ceasefire by Mizo rebels ordered by Laldenga (2). One dies, 300 hurt in football stadium collapse in Trivandrum; Judicial probe into the Moily tape episode ordered (9). Kar Seva of the Holy tank in the Golden Temple begins (12). PM tours drought-hit Andhra areas—announces Rs. 20 crore interim aid (Oct. 14).

Tamil Nadu CM MGR suffers a stroke (Oct. 14). Somnath Lahiri (75), CPI leader and former minister, dies (19). Japanese neurologist arrives to examine MGR (20). New party called Dalit Mazdoor Kisan party formed under the leadership of Charan Singh (21). Laldenga in Delhi for talks to end insurgency in Mizoram (29).

Indira Assassinated. Indira Gandhi assassinated by two of her own security guards at her residence in Delhi. Rajiv Gandhi sworn in Prime Minister (Oct. 31).

Violence following Mrs. Gandhi's assassination takes heavy toll, World dignitaries arrived in Delhi to pay homage to Mrs. Gandhi (Nov. 2). The body of Mrs. Gandhi consigned to flames; World pays a tearful homage; Violence continues in New Delhi. Toll rises to 900; Curfew reclamation; Delhi Lt

Governor Mr. P. G. Gawai replaced by M. M. K. Wali; MGR flown to New York in a special plane (3).

Major police shake-up in Delhi, four officers suspended and new security staff posted at PM's residence; Night curfew continues in Delhi; Sikh families take shelter at protection camps. MGR admitted to New York hospital (Nov. 6). Big shake-up at the top level of intelligence setup (7). Bombay High Court holds removal of nine part-time directors of Escorts illegal (9). 11 more Ministers inducted into AP Ministry.

Rajiv Gandhi elected Congress(I) President (Nov. 12). Lok Sabha elections announced for Dec. 24 and Dec. 27; Simultaneous Assembly poll in Tamil Nadu (13). TN assembly dissolved (15). Department of electronics announces new policy to liberalise manufacture and import of computer systems (19). MGR's nomination papers filed from Andipatti constituency in Madurai district; AP Assembly dissolved; N. T. Rama Rao seeks fresh mandate; 25 killed as two bogies of a local train in Byculla (Bombay) derail (22). Y. B. Chavan (71), former Deputy Prime Minister, dies (25).

UK Deputy High Commissioner Mr. Percy Norris shot dead in Bombay; Veteran CPI leader and ex-MP M. N. Govindan Nair (74), dies (27). Over 6,200 candidates to contest for 513 Lok Sabha seats—straight contests between Congress(I) and opposition for about 200 seats; Admiral R. H. Tahiliani takes over as chief of Naval staff; Mr. G. S. Tohra reelected SGPC chief (30).

Bhopal Disaster. 2,500 persons killed and 2,000 badly affected when they inhaled poisonous gas escaping from an insecticide plant in Bhopal (Dec. 3). Sri Lankan gunboats sink unarmed Indian trawler (6). The chairman of Union Carbide Warren Anderson arrested and released in Bhopal (7). Justice Thakkar Commission to enquire into the assassination of Indira Gandhi (10). Asoka Mehta, former Union Minister, dies (11).

First MIG 27M aircraft assembled by HAL takes off (Dec. 14). More than four tonnes of MIC neutralised in Bhopal (6). MGR has kidney transplant; operation successful; All of MIC in Bhopal Union Carbide Plant converted into carbaryl; appeal to people to return to city (19). Centre suspends manufac-

ture of MIC-based pesticide; Polling for eighth Lok Sabha and Tamil Nadu Assembly (24).

Supertanker Hit. Indian supertanker "Kanchenjunga" carrying 20,00,000 tonnes of oil hit in the Gulf; Poll violence toll 15 on the 1st day of the three-phase polling (Dec. 25). Poll Commission orders seizure of records of the Dist. Hospital and the Police at Rae Bareilly relating to the death of Harshwaroop Bajpai, an independent candidate.

Election Commission countermands elec-

tion from Rajampet constituency on the death of an independent candidate; Election Commission fixes January 28, 1985 for the by-election in the Uduma and Peringalam constituencies; Japan gives India soft loans of 61,460 million yen (about Rs. 300/- crores) for development projects (26). Congress(I) makes big gains (28). Ramakrishna Hegde, Karnataka Chief Minister resigns and recommends dissolution of the Assembly, following the Lok Sabha poll verdict; AIADMK sweeps back to power winning 198 of the 232 Assembly seats (29).

91. THE COUNTRY

India occupies a strategic position in Asia, looking across the sea to Arabia and Africa on the West and to Burma, Malaysia and the Indonesian Archipelago on the East. Geographically, the Himalayan ranges had kept India apart from the rest of Asia.

The fertility of the Indo-Gangetic belt, however, had proved to be such an irresistible magnet that hordes of people had pressed into India through the mountain passes from immemorial times. The geographical insularity, imposed by the mountains was thus broken time and again. Similarly the open seas on both sides to the Indian peninsula, far from being a barrier to free intercourse with other lands, turned out to be rich seaways of trade and exchange of ideas with countries lying far away.

Thus, neither the mountains nor the seas could keep India isolated from the mainstream of Asiatic history. On the other hand, the life-giving rivers that gushed down from the inaccessible mountains to the turbulent seas enabled India to open the first chapter of Asian history. This began with the Indus civilization, 8000 years ago.

Position. India lies to the north of the equator between 8° 4' and 37° 6' north latitude and 68° 7' and 97° 25' east longitude. It is bounded on the south west by the Arabian Sea and on the south east by the Bay of Bengal. On the north, north east and north west lie the Himalayan ranges. The southern tip, Cape Comorin (Kanyakumari), is washed by the Indian Ocean.

India measures 3214 km from the north to south and 2933 km from east to west with the

total land area of 3,280,483 sq.km. It has a land frontier of 15200 km and a coastline of 6083 km. Andaman and Nicobar islands in the Bay of Bengal and Lakshadweep (islands) in the Arabian Sea are parts of the territory of India.

India shares its political borders with Pakistan on the west and Bangladesh and Burma on the east. The northern boundary is made up of the Sinkiang province of China, Tibet, Nepal and Bhutan.

Geological Structure. Geologically, the sub-continent of India (including Pakistan and Bangladesh) is made up of three distinct crust blocks.

(1) *Peninsular India* or the Deccan Plateau, south of the Vindhyan mountains, (2) *Himalayan ranges* and their offshoots that bound India on the west, north and east, (3) *Indo-Gangetic Plain* formed by three big rivers, the Indus, the Ganga and the Brahmaputra. This plain separates the Deccan Plateau from the great mountain ranges.

These three blocks can be conveniently divided into two geological areas, (1) the Peninsular India, comprising the Deccan Plateau and its adjuncts and (2) the extra-Peninsular India, made up of the Himalayan mountains and the extensive Indo-Gangetic plain.

Peninsular India or the Deccan plateau is geologically the oldest portion of India's land surface and is believed to have been part of the super-continent which contained S. America, Africa, Australia, Antarctica and India.

Physiography. India has seven major physiographic regions: (1) Northern Mountains including the Himalayas and the mountain ranges in the north-east. (2) The Indo-Gangetic plain, (3) Central Highlands, (4) Peninsular plateau, (5) East Coast, (6) West Coast, (7) Bordering seas and islands.

All the major land forms, hills, mountains, plateaus and plains, are well represented in India. Much of the land surface of India has developed a plateau character. There are extensive plains either flat or rolling at levels ranging from 300 to 900 meters, dotted with conical or rounded hills or traversed by flat-topped ridges. These are mostly in the central highlands and the peninsular plateau of the Deccan.

The alluvial plains, however, have been the most important land area in India, historically. In the Indo-Gangetic belt, level lands thick with lush vegetation stretch for miles and miles. These plains have lured successive streams of invaders into India—the Aryans, Scythians, Huns, Pathans and Mongols. They have fostered the growth of great empires like those of the Mauryas, the Guptas and the Mughals.

Mountain System. India has seven principal mountain ranges: (1) the Himalayas, (2) the Patkai and other ranges bordering India in the north and north east, (3) the Vindhyas, (4) the Satpura, (5) the Aravalli, which separates the Indo-Gangetic plain from the Deccan Plateau, (6) the Sahyadri, which covers the eastern fringe of the West Coast plains and (7) the Eastern Ghats, irregularly scattered on the East Coast of India and forming the boundary of the East Coast plains.

Himalayas, the highest mountain-system in the world, is also one of the world's youngest mountain ranges. It extends practically uninterrupted for a distance of some 2500 km and covers an area of about 500,000 sq. km. It contains the world's highest mountain peak, *Everest* and some ten peaks rising above

7,500 m. It appears to have risen from the bottom of the sea as a result of a collision between the drifting Indian (peninsular) plate and the Tibetan block of South Asia about 50 million years ago. The Himalayas reached their present heights much later.

Many geologists think that the recurring earthquakes and tremors in the Himalayan range signify that the Himalayas is still shifting and possibly rising higher. Says Dr. K.S. Vaidya, "The restlessness of the Himalayas means that the moving (Indian) peninsula continues to prod and push it (Himalayas). Whenever accumulating stresses and strains are released through fracturing or cracking of the ground, it trembles, moves forward, up or down".

Through the millions of years that the Himalayas was rising, it was also being steadily eroded. This continuous erosion brought into being the three great rivers—Indus, Ganga and Brahmaputra. The alluvial soil brought down by these rivers through thousands of years filled up the vast depression between the Deccan plateau and the rising Himalayas and have brought into existence the present Indo-Gangetic plain.

Patkai and allied mountain ranges run along the Indo-Bangladesh-Burma border and may collectively be called *Purvachal* or eastern mountains. These ranges forming an arc must have come into existence along with the Himalaya.

Aravalli range in north-western India is one of the oldest mountain systems in the world. The present Aravalli range is only a remnant of the gigantic system that existed in prehistoric times with several of its summits rising above the snow line and nourishing glaciers of stupendous magnitude which in turn fed many great rivers.

Vindhyas range traverses nearly the whole width of Peninsular India—a distance of about 1050 km with an average elevation of some 300 meters. The Vindhyas range appears to have been formed by the weathered products of the ancient Aravalli ranges.

Satpura range, another ancient mountain system, extends for a distance of 900 km with many of its peaks rising above 1000 meters. It is triangular in shape, with its apex at Ratnapuri and two sides running parallel to the Narmada and Tapti rivers.

Sahyadri, or Western Ghats, with an average height of 1200 metres, is about 1600 km long and runs along the western border of the Deccan Plateau, from the mouth of the river Tapti of Cape Comorin (Kanyakumari), the southernmost point of India. It overlooks the Arabian Sea, and catches the full force of the monsoon winds, thus precipitating heavy rains on the West Coast.

Eastern Ghats, bordering the East Coast of India, is cut up by the powerful rivers into discontinuous blocks of mountains. In its northern parts between the Godavari and Mahanadi rivers it rises to above 1000 meters.

River System. There are three main watersheds in India. (1) Himalayan range with its Karakoram branch in the north, (2) Vindhyan and Satpura ranges in Central India and (3) Sahyadri or Western Ghats on the West Coast. All the major rivers of India originate in one or the other of these watersheds.

Rivers of India are estimated to carry 1,683,000 million cubic metres of water per year and in the process they do a lot of constructive work. They build alluvial terraces in the Himalayas, piedmont plains at the foot of the hills and mountains, flood plains in their courses throughout and deltas at their mouths.

The Indo-Gangetic plain in North India is the creation of the Indus, the Ganga and the Brahmaputra. The East Coast deltas are the handiwork of Mahanadi, Godavari, Krishna, Cauvery and Pennar rivers, while the West Coast deltas have been formed by Narmada and Tapti in the extreme north and by a host of lesser rivers—Sharavati, Netravati, Bharatapuzha, Periyar and Pamba in the far south.

The rivers of India may be broadly classified into two categories, the Himalayan group and the Deccan group.

Himalayan Group. The rivers of the Himalayan Group are geologically younger than those of the Deccan and are rapid torrential streams which are still in a very youthful or immature stage of development. They are continuously at work in degrading or lowering their channels and cutting deep gorges, hundreds of meters deep through the mountain paths of their tracks.

The main rivers of the Himalayan group are *Indus*, *Ganga* and *Brahmaputra*. These rivers are both snow-fed and rain-fed and have therefore continuous flow throughout the year. Himalayan rivers discharge about 70 per cent of the total discharge of the Indian rivers into the sea. This includes about 5 percent from central Indian rivers, that is, rivers which rise in central India. They join the Ganga and drain into the Bay of Bengal.

The Indus, which the Aryans called the Sindhu, has lent its name of India. Its valleys on both sides have been the seat of a civilization, that was not only anterior but also superior in many respects to the fabled civilizations of Sumeria and Egypt. This historic river has five major tributaries—Jhelum, Chenab, Ravi, Beas and Sutlej. These in turn have inspired the name Punjab (punj=five & ab=river), the Land of Five Rivers. The Indus rises from Mount Kailas in Tibet and traverses many miles through the Himalayas before it is joined by its tributaries in the Punjab. Thereafter it passes into Sind (Pakistan) to fall into the Arabian Sea.

The Ganga, famous alike in legend and history, is considered the most sacred river by the Hindus. It covers, what is called the heartland of India, which was the main centre of the ancient Aryan culture. It rises near the glacier, Gangotri in the Himalayas and flows through Uttar Pradesh, Bihar and Bengal to fall into the Bay of Bengal. Ganga and its tributaries Jamuna, Gomti, Garga, Sarda, Gandak, Chambal, Sone and Kosi, spread out like a fan in the plain of Hindustan thus forming the largest river basin in India, with an area, one quarter of the total area of India.

The Brahmaputra, rising in Western Tibet, flows for some 800 miles through the Himalayas, then turns south-west and then south, joining the easternmost branch of the Ganga—the Padma—and empties together with Ganga into the Bay of Bengal.

Deccan Group: The rivers of Deccan denuding their beds for long geological ages have developed flat valleys with low gradients. This major Deccan rivers are *Godavari*, *Krishna*, *Cauvery*, *Pennar*, *Mahanadi*, *Damodar*, *Sharavati*, *Netravati*, *Bharatapuzha*, *Periyar*, *Pamba*, *Narmada* and *Tapti*. These rivers are entirely rain-fed

with the result that many of them shrink into rivulets when the hot season opens. The Deccan rivers contribute about 30 percent of the total outflow in India. Of this, the rivers that flow from west to east account for 20 per cent and those from east to west about 10 per cent.

The Godavari, Krishna, Cauvery and Pennar all rise in the Western Ghats and traverse the plateau and the East Coast, to fall into the Bay of Bengal. Godavari has the second largest river basin in India, comprising about 10 per cent of the total area of India. The Krishna basin is the second largest in the Peninsula, and the third largest in the whole of India.

The Mahanadi and the Damodar rise in the north west of the plateau and flow east into the Bay of Bengal. The Mahanadi forms the third biggest basin in the peninsula and fourth in all India.

The Narmada and the Tapti rising in the northernmost extremity of the plateau fall into the Gulf of Cambay in the Arabian Sea. The Narmada has a fair by extensive basin, next only to those of Krishna and Mahanadi. *Rivers Sharavati, Netravati, Bharatapuzha, Periyar and Pamba* rise in the Western Ghats and cross the West Coast to fall into the Arabian Sea. These rivers are comparatively small with limited catchment areas and minor basins.

92. FLORA AND FAUNA

Few other countries of comparable size possess such a rich and varied vegetation as India. Situated as it is between 8°4' N. and 37°6' N. of the equator, the country has a great latitudinal spread which means a wide range of temperature conditions.

Altitudinally the extremes are even greater, ranging from sea-level to the highest mountains in the world. The humidity and rainfall also vary greatly, from the lowest point in Thar desert to the highest in the hills of Meghalaya where Cherapunji with an annual rainfall of 1080 cm is reputedly the rainiest spot in the world.

Eight Regions. The *Gazetteer of India* (1965) divides India into eight botanical regions:

(1) Deccan, (2) Malabar, (3) Indus plain, (4) Ganga plain, (5) Assam, (6) Eastern Himalayas, (7) Western Himalayas and (8) Andamans.

Deccan Region comprises the entire comparatively dry elevated tableland of the Indian Peninsula. Palms of different kinds are endemic to this region.

Malabar Region covers the entire West Coast and the mountains of the Western Ghats. This is a region rich in tropical vegetation. The forest areas abound in hard wood, like rosewood, ironwood and teak with numerous varieties of soft wood and bamboos of different kinds.

Indus region comprises the plains of Pun-

jab, Rajasthan, Yamuna river, Kutch and northern Gujarat. This is very poor in endemic plants.

Ganga region covers the entire area from Yamuna to Bengal and Orissa. Here the forests are of widely differing types. Sal forests, however, dominate.

Assam region is made up of the Brahmaputra and Surma Valleys with the intervening hill ranges. Here the vegetation is luxuriant, with tall savanna grass, broad-leaved forests and thick clumps of bamboos.

Eastern Himalayan region sweeps eastward from Sikkim and embraces Darjeeling, Kurseong and other places. About 4000 species of flowering plants including 20 palms are estimated to occur in this region. In the temperate zone of this region, we find different broad-leaved species, many laurels and maples, alder, birch, conifers and junipers. Rhododendrons, dwarf willows and bamboos are other plants that abound in this region.

Western Himalayan region extends from the Kumaon Hills to Kashmir. The lower zone of this region is practically covered with sal forests, except where the savannah lands break up the sal belt. Among palms, only 5

species occur in this region. *The temperate zone* of this region contains forests of conifers and broad-leaved temperate trees. Higher up appear deodar, spruce and silver fir. *The alpine zone* extends from the upper limit of the temperate zone to about 4500 m or higher. The characteristic trees of this area are silver fir, silver birch and junipers.

Andaman region comprises the islands of Andaman and Nicobar. The main types of forests in this region are mangrove forests, beech forests, evergreen, semievergreen and deciduous forests.

Mammals. The Indian mammalian fauna exhibits a great diversity in form. But certain groups like the duckbill, spiny ant-eater, kangaroo, opossum, koala, camel†, giraffe, zebra, hippopotamus, seals and walruses are completely absent in India.

Shrews, moles, hedgehogs, flying lemurs, bats ranging from big fruit-bats with wide wing span to tiny pipistrelles, monkeys, gibbons and langurs from the major group of mammalian animals in India. The pangolin (scaly ant-eater) is represented in India by a single family, *manidae*, with a single genus, *manis* and three species.

The higher simian apes like the gorilla, baboon, chimpanzee and orangutan are not found in India.

Carnivora. Two types of wolf are found in India, the woolly wolf of Western Himalayas, and the small Indian wolf which is seen throughout India. The jackal is the commonest of the *canidai*, being found in almost all villages, near hilly or forest areas. Four species of fox and several races of the Indian wild dog are found in jungle areas.

The sloth bear or the common black bear is found throughout India, and the snow, red or brown bear and the great Asiatic black bear in the Western Himalayas.

There is only a single species of panda, but 18 species of martens, weasels and others. Civets (civet cats), linsangs and mongooses of which there are 13 species are found all over India. The Indian or striped hyena is the only species of the family in India and is found in almost all the forests.

There are four species of panthers, the

† Domesticated one-humped camels are used in north-western India as draught animals.

The Black Buck

In India every region can claim its own special species of wild-life. No other country has so many kinds of deer, no less than nine; excluding sub-species they are the sambhar, the hangul, the swamp deer, the thamin, the hog deer, the chital, muntjac, the mouse deer and the musk deer of the sub-Himalayan tracts.

The most handsome of them all, are the black bucks of the desert districts of Rajasthan which are usually seen in herds of 20 or 30, sometimes in hundreds. They rest during the hot hours of the day. Keen eye-sight and speed are their protection; their sense of hearing is moderate and that of scent fair.

The leadership of a herd is usually vested in an old and vigilant female. When alarmed, the herd moves off in a series of light leaps and bounds and then breaks into a gallop.

Over long distances, the black buck is said to be the fastest animal in the world, capable of maintaining a speed of more than 65 km per hour.

A few years ago black bucks were found in very large herds, but now such sights are rare in many places. No Indian animal has, perhaps, suffered more at the cruel hands of man than the black buck.

common leopard found all over India, the all-black and albino leopards, both of which are aberrations but are often found and the snow leopard seen only in the Himalayas.

The tiger is the monarch of almost all Indian forests and very often a terror-striking animal especially when it turns maneater as it sometimes does.

The Board of Wild Life has declared Tiger as the national animal of India and a special project called 'Project Tiger' has been launched by the government to protect this fast-dwindling species.

Asiatic lion, once rampant in north India, disappeared towards the end of the 19th century, leaving barely a dozen head in the

Gir forest in Kathiawar in 1880. Since then, the stringent protective measures adopted by the Government have increased the lion population.

India has different varieties of cats, the Indian desert cat, the common jungle cat, the leopard cat and the fishing cat. The lynx is found in Kashmir while the caracal is found in northwestern India. The clouded leopard, a rare species, is found only in the Himalayas. The cheetah or the hunting leopard, one of the fastest runners known, has practically disappeared from India.

Herbivora. The Indian elephants rule the forests of peninsular India. Being quite intelligent and amenable to training, they are caught and used for hauling logs from inaccessible forests. They are also used in India for ceremonial purposes.

The great Indian one-horned *rhinoceros* was on the verge of extinction when the Government stepped in and provided sanctuaries for them.

Horses are not indigenous to India, and of asses, only a single species is found. Two species of pigs are found, the wild boar and the pygmy hog. Mousedeer, spotted deer, barking deer and sambar are found all over India. The musk deer is confined to Kashmir. The Kashmir stag or hangul, once abundant, is now a disappearing family. It is now a protected animal.

The four-horned antelope, black buck, and Indian gazelle are common all over India. The Indian buffalo in wild state is found in Nepal, Assam and Madhya Pradesh, while the Asiatic ibex is confined to the Himalayas. The nilgai or the blue bull is a large animal which is a pest to crops and ranges all over India, except Bengal and the West Coast.

Gaur, wrongly called Indian bison, is the

tallest and the most handsome of the world's wild oxen. They are a special attraction in Bandipur and Mudumalai sanctuaries in the south.

Reptiles. Only three species of crocodiles exist in India—the *gharial* found in a few rivers like the Indus, Ganga, Mahanadi and Brahmaputra, the *marsh crocodile* which is found all over India and the *estuarine crocodile*, that inhabits the mouths of rivers and canals near the sea. Alligators are not found in India. About 50 species of *turtles*, *tortoise* and *terrapins* are known in India. Lizards of four types and snakes of many families appear in India. Among the common snakes of India are the rat-snake, the common wolf-snake and grass-snake.

The Indian python is the biggest Indian snake going up to some 20 feet in length and weighing around 200 lbs. It is a beautiful snake, which is found everywhere in India, in the high forests, humid low-lying swamps and the arid thorn-bush scrub jungles.

Among the deadly poisonous snakes are the *krait* of which there are eleven species, *cobra* of which there are two varieties, the common cobra and the *king cobra* or Hamadrayed which grows up to about 4 to 5 metres. The *vipers* are represented by over 20 species, the commonest among them being *Russels viper*, *saw-scaled viper* and *pit-viper*.

Birds. It is estimated that there are 1200 species of birds in India, which work out at about 14 per cent of the world total of 8600. Together with their sub-species or geographical races, the Indian forms reach a total of 2061. Of these about 1750 are resident in India and the rest migratory.

Indian peacock with blue plumage has been declared the National Bird and is now a protected species.

93. CLIMATE AND RAINFALL

The climate of India may be broadly described as tropical monsoon type. There are four seasons—Winter, Summer, Monsoon and Post-Monsoon. The rainfall is erratic and ill-distributed. It varies from place to place and year to year.

The latitudinal spread of the country and the altitudinal differences prevailing from area to area, have combined to create

various climatic zones in the country. Parts of north India, for example, lying below the Himalayas have strong winters and hot sum-

mers, while the south generally has no winters at all. Allowing for such deviations, the climate of India may be broadly described as the tropical monsoon type. (See Flora and Fauna—supra).

Temperature. Naturally enough, hill stations, coastal areas and plateau regions have differing temperature conditions. Hill stations like Darjeeling and Simla have the lowest temperatures with an average temperature between 15.7° and 16.9°C In coastal areas, Bombay on the west coast has an average temperature of 30.5°, while Madras, on the east coast, goes up to 33.4°C. In the plateau, Dehra Dun records an average of 27.5° while Nagpur registers an average of 35.5°, the highest average in all India

The Indian Meteorological Department recognises four seasons (1) Cold weather season (Dec.-March) (2) Hot weather season (April-May), (3) Rainy season (June-Sept.) and (4) Season of retreating south west monsoon (Oct-Nov.)

In India, rainfall is erratic and ill distributed. It varies from place to place and from year to year. Areas like the West Coast, Bengal and Assam get the heaviest rainfall, with more than 80 inches annually. Places like Bombay, M. Pradesh and Bihar receive 40 to 80 inches rainfall, Madras, north-western Deccan and upper Gangetic plain have 20 to 40 inches rainfall. The Rajasthan

Rainfall Percentage

Period	India	Britain
June to Sept.	73.7	32.2
Oct. to Dec.	13.3	30.4
Jan. to Feb.	2.6	17.5
Mar. to May	10.4	19.9
Total	100	100

Seasonwise Distribution

Season	Duration	Percentage of annual rain
South-west monsoon	June-Sept.	73.7
Post-monsoon	Oct.-Dec.	13.3
Winter or north-east monsoon	Jan.-Feb.	2.6
Pre-monsoon	Mar.-May	10.4
	Total	100

Climatic Vagaries

Climatically India is a land of extreme paradoxes. Heavy rains leading to floods and low rains leading to drought exist side by side or one after the other.

Practically, the whole of Assam and its neighbourhood, the Western ghats and the adjoining coastal strip and parts of the Himalayas are areas of very heavy rainfall with more than 2,000 mm of annual rainfall. Some places in the Khasi and Jaintia Hills of Meghalaya receive the heaviest rainfall in the world. Cherrapunji gets 11,419 mm of annual rainfall, the highest in the country.

In contrast, Rajasthan, Kachchh and the high Ladakh plateau of Kashmir extending westward to Gilgit are regions of low precipitation. They have a yearly rainfall between 100 and 500 mm. Between these rainfall extremes, there are two areas of moderately high and low rainfall ranging from 1,000 to 2,000 mm and 500 to 1000 mm.

desert and the high Ladakh plateau of Kashmir receive only nominal rainfall, a mere four inches annually. At the other extreme, Cherrapunji in Meghalaya gets as much as 425 inches rainfall, the highest in all India.

A more important feature of Indian rainfall is that it is not evenly distributed all through the year, as in some other countries, Britain for example.

The Monsoon. India is fed by two rain-bearing winds, the Southwest Monsoon and the Northeast Monsoon. The Southwest Monsoon is the dominant monsoon in India. The Northeast comes in the wake of the Southwest and is comparatively a minor monsoon. It is confined to a smaller area of the country. Its duration is much shorter and its rains less copious. But for some parts of the country, particularly Tamil Nadu, the Northeast is the major monsoon.

The Southwest Monsoon opens on the west coast of India about the beginning of June. There is no set date for the onset of the monsoon. It may come in the middle of May

(1918) or the middle of June (1915) or any date in between. The date is important for two reasons. First, it is the green signal for agricultural operations. Second, it is only the monsoon rains that can relieve the scorching summer heat.

By May the hot season in India reaches its hottest. Heat waves sweep across the whole of north India and much of the south coming as far down as Madras. Sunstroke deaths in varying numbers in north and central India are an annual phenomenon.

Before the monsoon opens in full force in June, there are intermittent rains in April-May, known as *pre-monsoon showers*. These are crucial to cultivation as they are the first signals to start agricultural operations.

Cyclones are a periodic feature of India. They form during the Southwest Monsoon—covering pre-monsoon and post-monsoon rains. Cyclones form both in the Bay of Bengal and the Arabian Sea. They occur most frequently in the Bay of Bengal and infrequently in the Arabian sea. Those in the

Bay of Bengal appear from April to December, with the maximum frequency in October and the minimum in April. On an average, about 13 cyclonic storms arise in the Bay of Bengal every year but only 2 or 3 in the Arabian Sea. Among the coastal states in India West Bengal, North Orissa, and certain areas of Andhra Pradesh and Tamil Nadu on the Bay of Bengal coast and Gujarat on the Arabian Sea coast suffer the most severe damages from cyclones.

Cyclones, however, are harbingers of rain. According to C. P. Rao, Director, Cyclonic Warning Centre, Vizakhapatnam, "While the monsoon depressions generated over Bay of Bengal give copious rainfall over north and central India, the western disturbances fed by moist current from the Arabian Sea and/or Bay of Bengal give winter rains over north India. India owes its good annual rainfall of 115 cm to the moist current derived from or sustained by the Arabian Sea and Bay of Bengal. But for these seas, the country would have been poor in rainfall with large desert tracks."

94. THE PEOPLE

The people of India are largely the descendants of immigrants from across the Himalayas. It is still a moot point whether any native race evolved on Indian soil.

We know that the species known as *Ramapithecus* were found in the Siwalik foothills of the north-western Himalayas. This species believed to be the first in the line of *hominids* (human family) lived some 14 million years ago. Recent researches have shown that a species resembling the *Australopithecus* lived in India some 2 million years ago. Even this discovery leaves an evolutionary gap of as much as 12 million years since *Ramapithecus*.

Polygenetic. Very little research has been done regarding the ethnic origins of the Indian population. Perhaps it is of little import now. The fact is that the Indian population is polygenetic and is a confusing mixture of various racial strains. Few, if any, can claim to belong to any particular stock. Nevertheless, many Indians pride themselves on their Aryan descent.

The observations of Natwar Singh, minister-historian, are relevant in this context. Says Singh, "The unpalatable truth is, that for a vast number of people in north India, immaculate ancestry is a mirage. He is a brave man, who can with certitude prove his Aryan or Scythian descent. He, that has traced his birth to a mythological ancestor, has done so, to draw attention away from the intervening generations".*

We are giving below descriptions of the various races in India according to the classical pattern

Composition. According to Dr B.S. Guha, the population of India is derived from 6 main ethnic groups: 1. Negrito, 2. Proto-Australoids or Austriacs, 3. Mongoloids, 4. Mediterranean or Dravidian, 5. Western Brachycephals and 6. Nordic Aryans.

* K.Natwar Singh *Maharaj Suraj Mahal* (1707-1763)

Brachycephalic (broad headed) Negroids from Africa were the oldest people to have come to India. These people are now found only in patches among the hill tribes of south India (*Irulas, Kodars, Paniyans and Kurumbas*) on the mainland. But they survive in the Andaman Islands, where they have retained their language.† They are an inconsequential element in the population of India.

Proto-Australoids or Austriacs were a race of people, with wavy hair plentifully distributed over their brown bodies, long heads with low foreheads and prominent eye-ridges, noses with low and broad roots, thick jaws, large palates and teeth and small chins.

The Austriacs of India represent a race of medium height, dark (and in some cases black) complexion with long heads and rather flat noses but otherwise regular features. Miscegenation with the earlier Negroids may be the reason for the dark or black pigmentation of the skin and flat noses. Austric tribes spread over the whole of India and then passed on to Burma, Malaya and the islands of South East Asia. "The Austriacs form the bedrock of the people".‡

The Austriacs laid the foundation of Indian civilization. They cultivated rice and vegetables and made sugar from sugarcane. Their language has survived in the Kol or Munda speech, current in Eastern and Central India.

‡**Dravidians** comprise all the three subtypes, Paleo-Mediterranean, the true Mediterranean and Oriental Mediterranean.

They appear to be people of the same stock as the peoples of Asia Minor and Crete and the pre-Hellenic Aegeans of Greece. They are reputed to have built up the city civilization of the Indus Valley, whose remains have been found at Mohenjo-daro and Harappa and other Indus cities. The Dravidians must have spread to the whole of India, supplanting Austriacs and Negroids alike.

Mongoloids of various types are confined to the north-eastern fringes of India, in Assam, Nagaland, Mizo, Garo and Jainti Hills. Generally, they are people of yellow complexion, oblique eyes, high cheekbones, sparse hair and medium height.

Nordic Aryans who migrated to India were a branch of Indo-Iranians, who had originally left their homes in Central Asia, some 5000 years ago, and had settled in Mesopotamia for some centuries. The Aryans must have come into India between 2000 and 1500 B.C. Their first home in India was western and northern Punjab, from where they spread to the Valley of the Ganga and beyond. The Aryans, coming into India, encountered the highly civilized Indus Valley people who had big towns, with fortifications and brick structures and many of the amenities of quite high city civilization. The Indus people were essentially a city people while the Aryans were a pastoral race.

Though it is not exactly known what happened to the Indus people or the civilization, it may be assumed that they intermingled with the incoming Aryans, who adopted the Indus culture as their own.

95. THE POPULATION

India has a population of 685,184,692 according to the census taken in 1981. But, the latest UNFPA* report says that India's population has now grown to 746,742,000 and it projects a figure of 961,531,000 for 2000 A.D.

Although India accounts for only 2.4% of the total world area (world = 13589 million

sq. km. India 3.28 million sq. km), it contains about 15% of the world population.

† See Andaman & Nicobar Islands, *infra*

‡† Gazetteer of India

‡ The term **Dravidian** is derived from the pre-Hellenic Lycians of Asia Minor who called themselves **Trmmili**, which the Greeks wrote as **Termilai**. **Termilai** became **Dramiza**. **Dramiza** evolved itself in two ways. (1) In the South among the Dravidians, the process was **dramiza—damis—Tamiz** (modern Tamil). (2) In the north, among the Aryans, **dramiza—dramila—dravida** (Dravidian).

The other top countries in point of population are: China 21.72%, U.S.S.R. 6.05% and U.S.A. 5.04%. India, with China, U.S.S.R. and U.S.A. accounts for nearly 50% (48.34) of the world population.

The first census, that had an all-Ind

* UNFPA. United Nations Fund for Population Activity

India Population Totals

India/State/ Union Territory	Population in 1971 (and rank)	Population in 1981 (and rank)	1981 (per sq. km)
INDIA	548159652	685184692	216†
States			
Andhra Pradesh	43502708 (5)	53549673 (5)	195
Assam*	14625152(13)	19896843(13)	254
Bihar	56353369 (2)	69914734 (2)	402
Gujarat	26697475 (9)	34085799(10)	174
Haryana	10036808(15)	12922618(15)	292
Himachal Pradesh	3460434(18)	4280818(18)	77
Jammu & Kashmir	4616632(16)	5987389(17)	59
Karnataka	29299014 (8)	37135714 (8)	194
Kerala	21347375(12)	25453680(12)	655
Madhya Pradesh	42654119 (6)	5217844 (6)	118
Maharashtra	50412235 (3)	62784171 (3)	204
Manipur	1072753(20)	1420953(20)	64
Meghalaya	1011699(21)	1335819(21)	60
Nagaland	516449(23)	774930(23)	47
Orissa	21944615(11)	26370271(11)	169
Punjab	13551060(14)	16788915(14)	333
Rajasthan	25765806(10)	34261862(9)	100
Sikkim	209843(28)	316385(28)	45
Tamil Nadu	41199168 (7)	48408077(7)	372
Tripura	1556342(19)	2053058(19)	196
Uttar Pradesh	88341144 (1)	110862013 (1)	377
West Bengal	44312011 (4)	54580647 (4)	615
Union Territories			
Andaman and Nicobar Islands	115133(29)	188741(29)	23
Arunachal Pradesh	467511(25)	631839(24)	8
Chandigarh	257251(27)	451610(27)	3961
Dadra & Nagar Haveli	74170(30)	103676(30)	211
Delhi	4065698(17)	6220406(16)	4194
Goa, Daman & Diu	857771(22)	1086730(22)	285
Lakshadweep	31810(31)	40249(31)	1258
Mizoram	332390(26)	493757(26)	23
Pondicherry	471707(24)	604471(25)	1229
*Projected figures for 1981			

character, was taken in 1872. It was, however, a patchwork of census data taken in various parts of the country. The first regular census in India was taken in 1881. Thereafter, there have been regular censuses every 10 years. The 1981 census is the 12th census of India and the 4th since independence.

1981 Census. The population of India, as at sunrise on 1st March, 1981, was as follows: Total No. 685,184,692, Males: 54,467,000, Females: 330,717,692. These figures include the projected population for

Assam where census could not be held in 1981 owing to disturbed conditions there.

The following table indicates the ranking of the States by population size in 1981 and 1971. Uttar Pradesh continues to dominate the scene and retains its first position. Most of the other States have continued to retain their original ranks. However, Rajasthan has stolen a march over Gujarat and has moved up from the 10th place in 1971 to the 9th place in 1981 while Gujarat has moved from the 9th place in 1971 to the 10th place in 1981. Delhi which was 17th in rank in 1971 has overtaken

Jammu and Kashmir and moved to 16th place while Jammu and Kashmir has moved from 16th place in 1971 to the 17th place in 1981. Similarly, Pondicherry and Arunachal Pradesh which were 24th and 25th in rank in 1971 have exchanged ranks in 1981.

Uttar Pradesh, Bihar and Madhya Pradesh together account for 34 per cent of the population or more than one-third of the population of India in these three States.

Steady Growth. Except for a slight fall in 1911-21, the population of India has been steadily growing for the last 80 years (1901-1981). From 1951 onwards, the growth rate has been very high. In absolute terms, India's population has increased by 137 million in the decade 1971-81. This increase is 13 million more than the addition to the total population over the 50 years from 1901 to 1951.

All the States and Union Territories have had an increase in population but at different rates, and except for a few areas, the addition in numbers between 1971 and 1981 is higher than that between 1961-71. It is only in the states of Kerala, Orissa, Tamil Nadu and in the Union Territory of Goa, Daman & Diu that the absolute increase in the decade 1971-81 is lower than that in the former decade.

The decadal growth rates in these three states (Kerala, Orissa and Tamil Nadu) have been much lower than in the other States. The absolute increase in the decade 1971-81, as compared with that during 1961-71 is particularly noticeable in the case of Bihar, Rajasthan and Uttar Pradesh. This is important in demographic terms.

While there is doubtless an absolute increase in most cases, it will be noticed that in quite a few States the percentage decadal growth rate in the decade 1971-81 has been lower than that in the decade 1961-71. This is so in the case of Gujarat, Haryana, Himachal Pradesh, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Orissa, Tamil Nadu, Tripura, West Bengal and in the Union Territories of Andaman and Nicobar Islands, Arunachal Pradesh, Chandigarh, Delhi, Goa, Daman & Diu and Lakshadweep.

The decadal growth rate in the decade 1971-81 has been higher than the corresponding rate of the previous decade 1961-71

only in the states of Andhra Pradesh, Bihar, Karnataka, Nagaland, Punjab, Rajasthan, Sikkim, Uttar Pradesh and in the Union Territories of Dadra & Nagar Haveli and Mizoram.

Density of population as revealed by the final population figures of 1981 has been indicated in the table below. The highest densities in the country, with over 1000 persons to the sq. km are shown by 4 Union Territories, namely Delhi (4178), Chandigarh (3948), Lakshadweep (1257) and Pondicherry (1228).

Delhi and Chandigarh are cities with peripheral rural areas. Lakshadweep and Pondicherry are comparatively small in area.

Density
(In descending order)

State/Territory	Density per sq. km.	
	1981	1971
1 Delhi	4194	274
2 Chandigarh	3961	225
3 Lakshadweep	1258	95
4 Pondicherry	1229	95
5 Kerala	655	54
6 West Bengal	615	49
7 Bihar	402	32
8 Uttar Pradesh	377	30
9 Tamil Nadu	372	31
10 Punjab	333	26
11 Haryana	292	23
12 Goa, Daman & Diu	285	22
13 Assam	254	18
14 Dadra & Nagar Haveli	211	18
15 Maharashtra	204	17
16 Tripura	196	14
17 Andhra Pradesh	195	14
18 Karnataka	194	14
19 Gujarat	174	13
20 Orissa	169	14
21 Madhya Pradesh	118	8
22 Rajasthan	100	7
23 Himachal Pradesh	77	6
24 Manipur	64	4
25 Meghalaya	60	4
26 Nagaland	47	3
27 Sikkim	45	3
28 Andaman & Nicobar Islands	23	1
29 Mizoram	23	1
30 Arunachal Pradesh	8	1

There is not much point in comparing their densities with those of States. However, among the rest of the Territories and all the States, Kerala reports the highest density with 654 persons to the sq. km followed by West Bengal with 614.

The Sex Ratio is defined as the number of females per 1000 males in the population.

Sex Ratio 1901-1981

Year	Ratio
1901	972
1911	964
1921	955
1931	950
1941	945
1951	946
1961	941
1971	930
1981	938

The sex ratio has been generally adverse to women, i.e., the number of women per thousand men has generally been less than 1000. Apart from the fact that the sex ratio is adverse to women, it will also be noticed that the sex ratio has deteriorated over the decades. However, there is an apparent improvement in the sex ratio between 1971 and 1981.

The reason for the disparity in the sex ratio and the steady deterioration in the sex ratio are not quite clear. Explanations have been offered that there is a preference for male children resulting in neglect of female babies, that certain types of mortality are selective between males and females and that some part of the adverse sex ratio may be attributable to high maternal mortality.

There is little evidence to support the view that there is a deliberate neglect of female babies despite the fact that there may be a preference for male children. This is an area of uncertainty and requires further investigation.

It will be noticed that Kerala has the highest sex ratio of 1034 and is a solitary exception. In all the other States and Union Territories the sex ratio is adverse to women.

It is interesting to notice that certain States have had a fairly extended period where the sex ratio has been over one thousand, i.e.,

the sex ratio has been in favour of females. In the case of Kerala, the sex ratio has been throughout above 1000, while in Manipur, Orissa, Tamil Nadu, Goa, Daman & Diu, Lakshadweep and Mizoram it has been above 1000 for a considerable part of the period 1901 to 1981. On the other hand, the sex ratio has been constantly on the low side in comparison with other States and Union Territories in Haryana, Himachal Pradesh, Jammu and Kashmir, Punjab, Tripura, Andaman and Nicobar Islands, Chandigarh and Delhi. At this stage one would be reluctant to offer specific reasons for this phenomenon and this is an area, as mentioned earlier, of uncertainty which would merit more detailed consideration on the basis of further information.

Sex Ratio—States 1981 In descending order

Rank	State/Territory	Sex Ratio
	India	933
1	Kerala	1032
2	Himachal Pradesh	973
3	Pondicherry	985
4	Orissa	981
5	Goa, Daman & Diu	981
6	Tamil Nadu	977
7	Lakshadweep	975
8	Andhra Pradesh	975
9	Dadra & Nagar Haveli	974
10	Manipur	971
11	Karnataka	963
12	Meghalaya	954
13	Jammu & Kashmir	892
14	Tripura	946
15	Bihar	946
16	Gujarat	942
17	Madhya Pradesh	941
18	Maharashtra	937
19	Mizoram	919
20	Rajasthan	919
21	West Bengal	911
22	Assam	901
23	Uttar Pradesh	885
24	Punjab	879
25	Haryana	870
26	Arunachal Pradesh	862
27	Nagaland	863
28	Sikkim	835
29	Delhi	808
30	Chandigarh	769
31	Andaman and Nicobar Islands	760

Literacy. One of the important characteristics on which information is obtained in the census is literacy. For the purposes of the census, a person is deemed literate if he or she can read and write with understanding in any language. A person who can merely read but cannot write is not defined as literate. Children below five years of age were treated as illiterate.

Literacy rates would be more meaningful if one were to exclude the population in the age group 0-4 from total population. However, at this stage, this information is not available since it would only be generated through further tabulations. Therefore, for practical purposes the entire population is being taken into account including the population in the age group 0-4.

The table below presents the figures for the country at each census year. In working out the rates for 1981, the population of Assam and Jammu and Kashmir have been excluded as the census has not yet been taken there. The rates upto 1941 are for undivided India.

Literacy 1901-1981

Year	Persons	Males	Females
1901	5.35	9.83	0.60
1911	5.92	10.56	1.05
1921	7.16	12.21	1.81
1931	9.50	15.59	2.93
1941	16.10	24.90	7.30
1951	16.67	24.95	7.93
1961	24.02	34.44	12.95
1971	29.45	39.45	18.69
1981	36.17	46.74	24.88

States/Territories

Literacy ranking in 1981 and 1971*

Ranking in 1981	State/Union Territory	Literacy rate 1981	Literacy rate 1971	Ranking in 1971	Percentage increase of literacy
1	Kerala	70.42	60.42	2	16.55
2	Chandigarh	64.68	61.56	1	5.07
3	Delhi	61.06	55.61	3	9.80
4	Mizoram	59.50	53.79	4	10.90
5	Goa, Daman & Diu	55.86	44.75	6	24.83

6	Lakshadweep	54.72	43.66	7	25.33
7	Pondicherry	54.23	46.02	5	17.84
8	Andaman & Nicobar Islands	51.27	43.59	8	17.62
9	Maharashtra	47.37	39.18	10	20.90
10	Tamil Nadu	45.78	39.46	9	16.02
11	Gujarat	43.75	35.79	11	22.24
12	Manipur	41.99	32.91	14	27.59
13	Nagaland	41.99	27.40	9	53.25
14	Himachal Pradesh	41.94	31.96	15	31.23
15	Tripura	41.58	30.98	17	34.22
16	West Bengal	40.88	33.20	13	23.13
17	Punjab	40.74	33.67	12	21.00
18	Karnataka	38.41	31.52	16	21.86
19	Haryana	35.84	26.89	20	33.28
20	Orissa	34.12	26.18	21	30.33
21	Sikkim	33.83	17.74	27	90.70
22	Meghalaya	33.22	29.49	18	12.65
23	Andhra Pradesh	29.94	24.57	22	21.86
24	Madhya Pradesh	27.82	22.14	23	25.65
25	Uttar Pradesh	27.38	21.70	24	26.18
26	Dadra & Nagar Haveli	26.60	14.97	28	77.69
27	Bihar	26.01	19.94	25	30.44
28	Rajasthan	24.05	19.07	26	26.11
29	Arunachal Pradesh	20.09	11.29	29	77.95

Excludes Assam and Jammu and Kashmir.

One of the ironies in the Indian literacy situation is that while the percentage of literacy has been increasing every decade, the total number of illiterates has also been increasing. As between 1971 and 1981 the percentage has increased by nearly 7%. While this increase is reflected in the increase of literates by about 82 million the illiterates have also increased by 48 million as the following figures show.

	Literates	Illiterates
1971	156,440,275	372,145,203
1981	237,991,932	419,933,693

Female Literacy is of special importance in the Indian context because of the great disparity in male and female literacy rates. In 1901 there were 1466 male literates for every 100 females literates. By 1931 the disparity had been brought down to 560 males as against 100 females. Since 1950 the difference has been steadily whittled down bringing the ratio to 201 males for 100 females in 1981.

**States & Union Territories
By ranges of female literacy**

State/Union Territory	Per cent female literates	Percentage increase of fem. literacy 1971-81
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Female Literacy 50% and above

Kerala	64.48	18.73
Chandigarh	59.30	9.11
Mizoram	52.57	12.55
Delhi	52.56	10.07

Female Literacy 25%—50%

Goa, Daman & Diu	46.78	33.31
Pondicherry	44.30	27.96
Lakshadweep	44.21	44.67
Andaman and Nicobar Islands	41.85	34.52
Maharashtra	35.08	32.73
Punjab	34.14	31.81
Tamil Nadu	34.12	27.03
Nagaland	33.72	80.80
Gujarat	32.31	30.55
Tripura	31.60	49.13
Himachal Pradesh	31.39	55.17
Manipur	30.69	57.14
West Bengal	30.33	35.28
Meghalaya	29.28	19.22
Karnataka	27.83	32.71

Female Literacy less than 25%

Haryana	22.23	49.29
Sikkim	22.07	147.98
Orissa	21.11	51.65
Andhra Pradesh	20.52	30.29
Dadra & Nagar Haveli	16.75	113.65
Madhya Pradesh	15.54	42.31
Uttar Pradesh	14.42	36.68
Bihar	13.58	55.73
Rajasthan	11.32	33.81
Arunachal Pradesh	11.02	197.04

**Progress of Female Literacy
1901-1981**

Year	Number of literates Males	Females	Literate males per 100 lit. females
1901	11870758	809580	1466
1911	13552737	1298484	1043
1921	15690428	2221499	1208
1931	22274036	3977034	560
1941	NA	NA	NA
1951	46272335	13916683	332
1961	77906038	27565962	283
1971	112012994	49423270	227
1981	158837215*	79154717*	201

* Excludes Assam and Jammu and Kashmir. 'NA' stands for not available.

96. RELIGIOUS COMMUNITIES

The major religious communities of India are the Hindus, Muslims, Christians, Sikhs, Buddhists and Jains. Of these the last two are numerically insignificant but they are important in other ways.

Of the 665,287,849 people in India in 1981 (Assam not included), the Hindus account for the largest community with 549,779,481 members. Other communities are divided as follows:

Muslims: 75,512,439, Christians: 16,165,447, Sikhs: 13,078,146, Buddhists: 4,719,796, Jains: 3,206,038, Other Religions: 2,766,285, Religions not stated: 60,217.

The Scheduled Castes and Scheduled Tribes who are part of the Hindu community form over 23.51% of the total population, about 156 million.

The data of the 1981 Census offers some

other statistics also of interest to religious sociologists. The Appendix of the Household Population gives 183 subdivisions that are grouped together in the general statistics as "other religions and persuasions."

Of these, 71,630 are Zoroastrians, and 5,618 Jews.

Adivasi. There are 25,416 "Adivasis" by religion and there are 1,367 "tribals" (in Nagaland), 119 "animists", and 25,985 whose religion is simply "Non-Christian" (in Manipur, Meghalaya and Nagaland), together with 796 "pagans" in the same three States, and 1,215 "Meathan" in Manipur

Some other tribals have given their specific tribal identity as their religions: as for example, the census has the record of 484 Oraons, 32,252 Santals, 1,481 Garos, 6,975 Gonds, 4,133 Hos, 148,437 Khasi, 1,160 Mundas, 1,296 Nagas.

Nirankaris, numbering 3382, of apparently Hindu following, have entered themselves under geographical or caste terms like Agarwal, Bengali, Gujarati, Maharashtrian, Marathi, Marwari, Malayalee, Tamilian and Teluguite.

Perhaps of more interest is that a total of 29,086 persons corresponding to 5,117 households consider themselves as "atheists" (predominantly in rural areas of Tamil Nadu, Maharashtra, Madhya Pradesh, Manipur and Bihar). There are 816 humanists ("manab dharma"), half of them in Maharashtra.

Census of 1981 gives some other interesting data too.

Fertility. "The total fertility rate in India (excluding Assam) is 3.9 in rural areas, 2.8 in urban areas, and 3.6 for total areas.

"It may be noted that fertility is higher among Muslims, followed by Buddhists, Hindus, Sikhs, Jains and Christians.

"At the national level, the total fertility rate for both Jains and Christians is identical, being 2.6. However, both in rural and urban areas the fertility of Jains is higher than that of Christians.

"This apparent contradiction in the total

Religious Members

Religions	Membership Percentage	
Hindus	549,779,481	82.64
Muslims	75,512,439	11.35
Christians	16,165,447	2.43
Sikhs	13,078,146	1.96
Buddhists	4,719,796	0.71
Jains	3,206,038	0.48
Other Religions	2,766,285	0.42
Religion not stated	60,217	0.01

Growth Highest And Lowest

Which are the slowest growing and fastest growing communities in India? According to 1981 Census, Christians have the lowest growth-rate recorded for the 10 years between 1971 and 1981. And Muslims have the highest.

The Census of 1971 accounted for 13,844,031 Christians in India and by 1981 they grew to become 16,165,447—a growth of 16.17 per cent.

By comparison, in the same period, the Muslims grew by 30.59 per cent while the Sikhs by 26.15, the Hindus by 24.15, Jains by 23.69 and the Buddhists by 22.52.

In this period the average population growth of the country was 24.69, while the Christians' was 8.52 per cent less than the average, the Muslims' was 5.9 per cent above.

fertility rate for all areas is due to the rural-urban distribution differentials in these groups."

The total fertility rate for Sikhs is 3.4, for Hindus and Buddhists 3.6 and for Muslims 4.1.

Female Ratio. The Christian female ratio compared to the males is by far the highest among the various communities. They have for every 1,000 males, 992 females; while Buddhists have 953, Jains 941, Muslim 937, Hindus 933 and Sikhs 880.

But on the other hand, according to census report, Christian women tend to marry rather late and therefore the percentage of married women in the fertile age group (between 15 and 49) is only 62.15, while for the Sikhs it is 70.40, for Jains 72.09, for Buddhists 79.26, for Muslims 80.42 and for Hindus 82.35.

97. PRINCIPAL LANGUAGES

India has 15 officially recognised languages. This is an evolution in a land of myriad tongues. The 1961 and 1971 Censuses had listed 1652 languages as the mother tongues spoken in India. This Babel of tongues has been built up through the ages by the various races that came into the land from time immemorial.

The Indian languages of today have evolved from different language families corresponding more or less to the different ethnic elements that have come into India from the dawn of history. They may be grouped into 6 groups as under: 1. Negroid, 2. Austric, 3. Sino-Tibetan, 4. Dravidian, 5. Indo-Aryan and 6. Other Speeches.

These languages have interacted on one another through the centuries and have produced the major linguistic divisions of modern India. Among the major groups, the *Aryan* and the *Dravidian* are the dominating families. They have influenced each other and have, in turn, been influenced by the Austric and Sino-Tibetan tongues. It is easy to spot Sino-Tibetan and Austric borrowings in the Aryan and Dravidian languages and mutual borrowings of the Aryan and Dravidian groups.

The Aryan. *Indo-Aryan*, the Indic branch of the Indo-European family, came into India with the Aryans. It is the biggest of the language groups in India, accounting for about 74 per cent of the entire Indian population.

The important languages in this group are: Western Punjabi, Sindhi, Eastern Punjabi, Hindi, Bihari, Rajasthani, Gujarati, Marathi, Assamese, Bengali, Oriya, Pahari, Kashmiri and Sanskrit.

Hindi or Hindustani has produced two great literatures, *Urdu* and (High) *Hindi*. Both have the same grammar and the same basic vocabulary. They differ, however, in script and higher vocabulary. *Urdu* uses the Perso-Arabic script. *Hindi* uses the Nagari script and has a preference for purely Indian words, in contradistinction to the numerous Arabic and Persian words borrowed by *Urdu*.

Sanskrit, the classical language of India, represents the highest achievement of the Indo-Aryan languages. Although hardly spoken now-a-days, Sanskrit has been listed a nationally accepted language in the VIII Schedule to the Constitution.

Dravidian languages form a group by themselves, and unlike the Aryan, Austric or Sino-Tibetan speeches, have no relations outside the Indian subcontinent, that is, India, Pakistan and Bangladesh. The Dravidian family is the second largest group in India,

Syrian Christians

The Gazetteer of India considers the Syrian Christians an immigrant community who had discarded their native Syrian in favour of the language of their domicile—Malayalam. This is a misinterpretation.

Of course, there is a small section of Syrian Christians who claim that they are descended from the original Syrian settlers in Kerala. But the great majority of the Syrian Christians do not make any such claim. On the other hand, they pride themselves in being the descendants of Indians who were converted to Christianity by St. Thomas the Apostle in the first century A.D.

From the earliest times, the Syrian community on the west coast of India was in communion with the Christian churches in the Middle East from whom they derived their Syrian liturgy. This is why they were called Syrian Christians and not because they were Syrian immigrants.

covering about 25% of the total Indian population

The Dravidian language came into India centuries before the Indo-Aryan. It split into three branches in the Indian subcontinent—(i) The northern branch comprised *Brahui* spoken in Baluchistan and *Kurukh* and *Malto* spoken in Bengal and Orissa. (ii) The central branch was composed of *Telugu* and a number of dialects spoken in Central India—*Kui*, *Khond*, *Holani*, *Konda*, *Gondi*, *Naiki*, *Parji*, *Koya* and others. (iii) The southern branch was made up of *Tamil*, *Kannada*, *Malayalam*, *Tulu*, *Badaga*, *Toda*, *Kota* and *Kodagu*.

The outstanding languages of the Dravidian group are: (i) *Telugu*, the State language of Andhra Pradesh, numerically the biggest of the Dravidian languages. (ii) *Tamil*, the State language of Tamil Nadu, apparently the oldest and purest branch of the Dravidian family. (iii) *Kannada*, the State language of Karnataka, another ancient Dravidian language that has developed individually. (iv) *Malayalam*, the State language of Kerala, the smallest and the youngest of the Dravidian family.

Common Language.

India never had a common language which was intelligible to the masses everywhere in India. For many years, Sanskrit remained a common medium. But it was the language of the learned classes and not of the masses. Under the British, English became a sort of lingua franca. Here again, it was restricted to the educated few.

With independence, the question of a common language naturally came up. The Constituent Assembly could not arrive at a consensus in the matter. The question was put to vote and Hindi won on a single vote—the casting vote of the President.† Hindi however, was only one of the many regional languages of India. The Indian National Congress has advocated the formation of linguistic provinces. The acceptance of this policy involved the statutory recognition of all the major regional languages.

The Constitution therefore recognised Hindi in Devanagari script as the official

Of the 1652 mother tongues listed in the census, 33 were spoken by people numbering over a lakh. The following table shows the names of mother tongues and the number of speakers

Mother Tongue ...	Speakers
Hindi ...	153,729,062
Telugu ...	44,707,797
Bengali ...	44,521,533
Marathi ...	41,723,893
Tamil ...	37,592,794
Urdu ...	28,600,428
Gujarati ...	25,656,274
Malayalam ...	21,917,430
Kannada ...	21,575,019
Oriya ...	19,726,745
Bhojpuri ...	14,340,564
Punjabi ...	13,900,202
Assamese ...	8,958,977
Chhattisgarhi ...	6,693,445
Magahi/Magadhi ...	6,638,495
Maithili ...	6,121,922
Marwari ...	4,714,094
Santali ...	3,693,558
Kashmiri ...	2,421,760
Rajasthani ...	2,093,557
Gondi ...	1,548,070
Konkani ...	1,522,684
Dogri ...	1,298,855
Gorkhali/Nepali ...	1,286,824
Garhwali ...	1,227,151
Pahari ...	1,269,651
Bhili/Bhilodi ...	1,250,312
Kurukh/Oraon ...	1,240,395
Kumauni ...	1,234,939
Sindhi ...	1,204,676
Lamani/Lambadi ...	1,203,338
Tulu ...	1,156,950
Bagri ...	1,055,607

Source: Language Handbook

language of the Union (Art. 343 et seq.) and the regional languages as the official languages of the States concerned (Art. 345 et seq.). English was recognised as the authoritative legislative and judicial language (Art. 348 et seq.). A schedule—the 8th Schedule—was added to the Constitution to indicate all regional languages statutorily recognised. The Schedule now contains 15 languages as follows:

(1) Assamese (2) Bengali (3) Gujarati

† Ordinarily when there is a tie between two groups in a meeting and the President is called upon to exercise his casting vote, he votes for the status quo. Here it was the other way round.

- (4) Hindi (5) Kannada (6) Kashmiri
 (7) Malayalam (8) Marathi (9) Oriya
 (10) Punjabi (11) Sanskrit (12) Tamil
 (13) Telugu (14) Urdu (15) Sindhi.

Recognised Languages. Of the 15 languages listed in the schedule, all except three—Sanskrit, Kashmiri and Sindhi—are official languages of the various States.

Assamese, an Indo-Aryan language, is the official language of Assam State. More than 57 per cent of the population of Assam speak Assamese.

Assamese has developed as a literary language from the 13th century.

Bengali, one of the leading Indo-Aryan languages, is the official language of West Bengal. It is spoken by 86 million people, the majority of whom are now in Bangladesh, formerly East Pakistan. Bengali emerged as a separate language around A.D. 1000. It is now one of the most advanced languages of India.

Gujarati, a member of the Indo-Aryan family, is the official language of the State of Gujarat. Gujarati started out as an independent language around A.D. 1200. It has progressed at a rapid pace and is now one of the most developed Indian languages.

Hindi, numerically the biggest of the Indo-Aryan family is the official language of the Government of India.

Among the various dialects of Hindi, the dialect chosen as official Hindi is the standard *Khariboli*, written in Devanagari script. This speech was originally spoken in Delhi and some western UP districts. From the literary point of view, the term Hindi covers not only the Khariboli form, but also a number of other dialects like Brajbhasha, Bundeli, Awadhi, early Marwari of Rajasthan and the Maithili and Bhojpuri speeches of Bihar.

Being the official language of six States and the Indian Union today, Hindi is receiving high patronage. This patronage and support has encouraged the development of Hindi as a great literary language.

Kannada, the official language of the state of Karnataka, belongs to the Dravidian family. The majority of its speakers is found in Karnataka where they form more than 65 per cent of the population. Kannada, as an independent language, dates from the 9th

century. It has rich literary traditions.

Kashmiri, a language of the Indo-Aryan group, is often mistaken as the state language of Jammu and Kashmir. Actually, Urdu is the State language of Jammu and Kashmir.

Kashmiri-speaking population in Jammu and Kashmir comes to about 55 per cent of the total population. Kashmiri literature goes back to A.D. 1200. It is comparatively a developed language. It is written, at present, in the Perso-Arabic script.

Malayalam, a branch of the Dravidian family, is the official language of the State of Kerala. Malayalam struck out on its own by the 10th century A.D. It is one of the most developed languages of India.

Marathi, belonging to the Indo-Aryan stock, is the official language of Maharashtra.

Though Marathi separated from the main Indo-Aryan stock at a very early date, its literary career began only in the 13th century. Since then, it has made wonderful progress. It has today a fully developed literature of the modern type.

Oriya, a branch of the Indo-Aryan family, is the official language of the State of Orissa, where Oriya-speaking population comprises some 82 per cent of the population.

Oriya is found recorded as far back as the 10th century. But its literary career began only in the 14th century.

Punjabi belongs to the Indo-Aryan family and is the official language of the State of Punjab.

Punjabi, though a very ancient language, turned literary only in the 15th century. From the 19th century, Punjabi showed vigorous development in all branches of literature. It is written in the Gurumukhi* script.

Sanskrit, the classical language of India, is also one of the oldest languages of the world—perhaps the very oldest to be recorded. It starts with Rig Veda, which appears to have been composed around 2000 B.C. Early Sanskrit is known as Vedic Sanskrit and covers the period between 2000 and 500 B.C. Classical Sanskrit covers the period between 500 B.C. and A.D. 1000.

Sindhi is a branch of the Indo-Aryan family. It is spoken by some 7 million people, of

* 'Gurumukhi' literally means 'from the face of the guru'. It is the name given to the script devised by the Sikh guru, Guru Angad, in the 16th century. The Gurumukhi is based on the old Sharda script, which is related to the Nagan script.

whom 5½ million live in Sind (Pakistan), and the rest mostly in India.

Sindhi has preserved some of the archaic features of the old Indo-Aryan language. Sindhi uses the Perso-Arabic script in Pakistan. Speakers in India use the Devanagari script. Of late Sindhi has developed noteworthy literature also.

Tamil, the oldest of the Dravidian languages, is the State language of Tamil Nadu. Tamil literature goes back to centuries before the Christian era. "In originality, though not in extent, Tamil literature stands by itself". It represents certain new literary types which are not found in Sanskrit or other Aryan languages. The language is spoken by 30 million or more and judging by its modern publications, it is advancing at a fantastic pace.

Telugu, numerically the biggest of the Dravidian languages, is the State language of Andhra Pradesh. It is the biggest linguistic unit in India, next to Hindi. Telugu is found recorded from the 7th century A.D. But it was only in the 11th century that it broke out into a literary language.

Urdu, the State language of Jammu and Kashmir, is spoken by more than 28 million people in India (1981 census).

The name Urdu is derived from 'Zaban-e-Urdu-Muala' which means the language of the exalted camp or court. The exalted camp or court here meant the camp or court of the ruling Sultans of Delhi.

Urdu and Hindi have proceeded from the same source, that is, from the Khariboli

speech of Delhi and surrounding areas. The Khariboli was a spoken language which prevailed around Delhi, since the 13th century.

In the 19th century, when the Delhi Sultanate disappeared and the British became the rulers, Sir Sayyed Ahmed Khan (1817—1898) started a revival of Urdu, as the language of the Muslims in India. Modern Urdu was thus born.

Urdu has produced an extensive literature. Muslim speakers of Urdu use the Perso-Arabic script while Hindus use the Devanagari script. Urdu is also written in Roman characters.

Official Languages. Art. 343 of the Constitution provided that for a period of 15 years from the commencement of the Constitution the English language shall continue to be used for all official purposes of the Union. It was expected that after the expiry of the stipulated period (that is after 1965) Hindi will displace English as the official language of the Union.

Subsequent developments have turned the current in favour of continuing English as an additional official language, no definite date being fixed for its elimination and replacement by Hindi.

As matters stand, the languages listed in the Constitution remain the official languages in the respective States, while Hindi and English continue to be used for inter-State correspondence and for all-India use generally.

98. THE CONSTITUTION

The Constitution of India came into effect on 26th January 1950. It was drawn up by a Constituent Assembly initially summoned on Dec.9, 1946. The constitution was adopted on November 26, 1949.

The Constituent Assembly was initially summoned for undivided India. With the partition of India in June 1947, the delegates of the Pakistan areas ceased to be members of the Assembly. On August 14, 1947, the Constituent Assembly met again as the Sovereign Constituent Assembly for the Dominion of India under the Presidentship of Sachidananda Sinha. On the demise of Sinha, Dr. Rajendra Prasad became the President

of the Assembly. A draft Constitution was published in February 1948. The Constitution was finally adopted on 26th Nov. 1949. It came into effect on 26th Jan. 1950.

Basic Features. The Indian Constitution closely follows the British Parliamentary model but differs from it in one important respect. In Britain, the Parliament is supreme. No court can question the validity of

any law passed by the British Parliament. In India the Constitution is supreme, not the Parliament. So the Indian courts are vested with the authority to adjudicate on the constitutionality of any law passed by Parliament.

This position, otherwise clear, was complicated by the action of the Constituent Assembly itself. Having promulgated the Constitution, the Constituent Assembly converted itself into the first Indian Parliament. Thus the creator of the constitution, the Constituent Assembly, became the creature of the constitution, the Parliament. In the very second year of promulgating the constitution, the first Parliament set out amending it. This was the *First (Constitution) Amendment Act, 1951*. This amendment planted the seeds of the future trouble between the Parliament and the Judiciary. It clearly showed that the Parliament possessed both constituent and legislative powers. Subsequent Parliaments naturally claimed plenary powers to amend the constitution, in any manner they thought fit.

The powers claimed by Parliament, on the one hand, and the rights vested in the Judiciary, on the other, were bound to clash in the long run. And so they did. The conflict at first centred round specific provisions of law passed by Parliament. When any such provision was declared unconstitutional, the laws were either amended to suit the constitution or the constitution was amended to suit the laws. Such a course naturally precipitated the question whether Parliament possessed unlimited powers to amend the constitution.

Power to Amend. The question came up in the Keshavananda Bharati case (1973) where the Supreme Court ruled that the power of amendment vested in the Parliament under Art. 368 (relating to amendment of the constitution) cannot be so exercised as to alter or destroy the basic structure of the constitution. If Parliament had the power to destroy the basic structure of the constitution, it would cease to be a creature of the constitution and become its master.

The question came up again in the *Minerva Mills* case, after the 42nd amendment was passed. The 42nd amendment effected a constitutional revolution, whereby Parliament overthrew the supremacy of the constitution and made itself supreme in its stead.

The first question before the court was whether the Parliament had unbounded powers to amend the constitution.

The Supreme Court delivered its judgement in the *Minerva Mills* case on May 9, 1980. The court held that the Parliament cannot expand its amending power under Art. 368, so as to abrogate the constitution or to destroy its essential feature. Their Lordships observed, "The donee of a limited power cannot by exercise of that power convert the limited power into an unlimited power". The avowed purpose of the 42nd amendment was to remove doubts.

"But", said the Court, "after the decision of this court in Keshavananda Bharati case, there could be no doubt as regards the limitations of Parliament's power to amend the constitution. The new clause (5) of Art. 368 confers on the Parliament an undefined power to amend the constitution, even so as to distort it out of recognition...No constituent power can conceivably go higher than the skyhigh power conferred by clause (5), for, it even empowers the Parliament to repeal provisions of the constitution, that is to say, destroy democracy and substitute for it a totally antithetic form the government."

Balance of Power. Another question before the Court was whether the Parliament had the power to bar the jurisdiction of the court to enquire into the constitutional validity of laws. On this question the court ruled that "Our constitution is founded on a nice balance of power among the three wings of the State, namely the Executive, the Legislature and the Judiciary. It is the function of Judges, nay their duty, to pronounce upon the validity of laws."

"Human dignity" (sic), the court observed, has not yet devised a system by which the liberty of the people can be protected, except through the intervention of courts of law". Again, "The conferment of the right to destroy the identity of the constitution, coupled with the provision that no court of law shall pronounce upon the validity of such destruction, seems to us a transparent case of transgression of the limitations on the amending power."

A third question which the court had to consider was the precedence of Directive Principles over Fundamental Rights. This question was first projected by the 25th

amendment. This amendment gave precedence to two clauses of Directive Principles as against Fundamental Rights. They are Art. 39(b) which related to the ownership and control of the material resources of the community and Art. 39(c) which concerned the question of concentration of wealth in a few hands to the detriment of the community.

The court conceded the application of the principle to the two clauses in question. In the 42nd amendment, this precedence was extended to all the Directive Principles. The court objected to this extension and ruled that "to destroy the guarantees given by Part III (Fundamental Rights) in order purportedly to achieve the goals of Part IV (Directive Principles) is plainly to subvert the constitution by destroying its basic structure".

So far only the three points mentioned above have been identified as Basic Features of the constitution. What the other basic features (if any) are, remains to be elucidated.

The Constitution consists of the following:
1. The Preamble. 2. Parts I to XXII covering Articles 1 to 395. 3. Schedules 1 to 10 * and 4. An Appendix†.

The Preamble. The Preamble declares India a sovereign *Socialist Secular* Democratic Republic and lays down the primary objects of the constitution, namely, to secure to all citizens justice, social, economic and political, liberty of thought, expression, belief, faith and worship, equality of status and opportunity and fraternity assuring the dignity of the individual and the unity and the integrity of the nation.

The words '*socialist, secular*' and '*the unity and the integrity of the nation*', were added by the 42nd Amendment.

Structure. India, that is Bharat, shall be a Union of States (Art. 1). The States and Territories thereof shall be as specified in the first Schedule (Art. 2).

Distribution of Powers. The Union has exclusive power to make laws on all matters in List I of the Seventh Schedule (Union List). The States have exclusive power to make laws on all matters in List II (State List). The Union and States have concurrent powers to legis-

late on any matter enumerated in List III (Concurrent List) (Art. 246).

Residuary Powers. The Union has exclusive power to make laws on any matter not enumerated in the Concurrent List or State List (Art. 248).

Over-riding Powers. In case of any conflict between Union laws and State laws, the Union laws shall prevail (Art. 254).

Citizenship rights are given to every person who is born in India or either of his parents was born in India or who has been a resident of India for 5 years, immediately preceding the commencement of the Constitution.

The Constitution of India commenced on the 26th January 1950.

Fundamental Rights. Seven Fundamental Rights are granted to citizens under Arts. 12 to 35 of the Constitution (Part III). They are: 1. Right to Equality, 2. Right to Freedom, 3. Right against exploitation, 4. Right to freedom of Religion, 5. Cultural and Educational Rights, 6. Right to Property and 7. Right to constitutional Remedies, that is to say, all citizens are guaranteed the right to move the Supreme Court or the High Courts by appropriate proceedings for the enforcement of Fundamental Rights.

The 16th and 24th Amendments have considerably limited the exercise of Fundamental Rights. Two, in particular, (the Right to Freedom and the Right to Property) have been reduced to names by the 1st, 4th and 24th amendments. The State is empowered to pass laws imposing reasonable restrictions on the exercise of these two rights.

Directive Principles. The Directive principles of state policy are contained in Arts. 36 to 51 of the Constitution (Part IV). These lay down 19 objectives covering a wide range of subjects, which the State shall endeavour to achieve. These are not enforceable at law like Fundamental Rights. Nevertheless, they are declared fundamental to the governance of the country.

Subsequent amendments starting with the 25th have attempted to give precedence to Directive Principles over Fundamental Rights. The 25th amendment restricted such precedence to two objectives, contained in cl. (b) and (c) of Art. 39. They relate to the equitable distribution of material resources and the

* Schedule 10 was omitted by 36th Amendment, but was added again in 1985 by the 52nd Amendment.

† Appendix contains the order extending the application of the constitution to Jammu & Kashmir

concentration of wealth in the hands of a few to the detriment of many. These, it may be noticed, were already secured by the amendments to Fundamental Rights which empowered the State to impose reasonable restrictions to the right to property. The 42nd amendment sought to extend this precedence to all objectives specified in Directive Principles. This provision was struck down by the Supreme Court (see *supra*.)

The President. There shall be a President of India (Art. 52) who is the Executive head of State—[Art. 53—(1)]—and the Supreme Commander of the Armed forces Art. 53(2). The President shall be elected from an electoral college consisting of (a) the elected members of both Houses of Parliament and (b) the elected members of the Legislative Assemblies of the States (Art. 54). The President shall hold office for five years Art. 56(1) and is eligible for reelection (Art. 57).

The Vice-President shall be elected by the members of an electoral college consisting of the members of both houses of Parliament Art. 66(1). The Vice-President may hold office for five years (Art. 67), and shall be the ex-officio Chairman of the Council of States (Art. 64).

Council of Ministers. There shall be a Council of Ministers with the Prime Minister at the head to aid and advise the President in the exercise of his functions—[Art. 74(1)]. The Prime Minister shall be appointed by the President, and the other Ministers shall be appointed by the President, on the advice of the Prime Minister—Art. 75(1). The Ministers shall hold office during the pleasure of the President—Art. 75(2). The Council of Ministers (as at present constituted) consists of the Prime Minister and (1) Ministers who are members of the cabinet, (2) Ministers of State (Union Ministers) who are not members of the cabinet and Deputy Ministers.

Administrative Organisation. A Secretary to Government is the administrative head of a ministry and the principal adviser of the minister. When the volume of work in a ministry exceeds the manageable charge of the Secretary, one or more wings may be established under a Joint Secretary. A ministry is divided into divisions, branches and sections functioning under Deputy Secretar-

ies, Under Secretaries and Section Officers respectively.

The Parliament. There shall be a Parliament for the Union, which shall consist of the President and two Houses, the Council of States (Rajya Sabha) and the House of the People (Lok Sabha)—Art 79.

The Council of States shall consist of not more than 238 elected representatives of States and Union Territories and 12 members to be nominated by the President (Art. 80). The House of the People shall consist of not more than 500 members chosen by direct election from territorial constituencies in States and not more than 25 members to represent Union Territories (Art. 81).

The Council of States shall not be subject to dissolution but as nearly as possible one-third of its members shall retire, as soon as may be, after the expiry of 2 years. The House of the People shall continue for 5 years (unless sooner dissolved) from the date of its first meeting and no longer and the expiry of the said period of five years shall operate as dissolution of the House (Art. 83). This mandatory provision of dissolution may be extended for a year due to emergency.

Parliamentary Committees. The following committees are appointed to assist the Parliament in its deliberations: 1. Public Accounts Committee, 2. Estimate Committee, 3. Public Undertakings Committee, 4. Committee on Government Assurances.

Separation of Powers. In a presidential system of government like that of the USA, the three branches of government—the Legislature, the Executive and the Judiciary—are independent units. But in a Parliamentary system like that of India the Executive is subordinate to the Legislature. The Judiciary alone functions as an independent branch.

Supreme Court of India. Chapter IV Part IV of the Constitution deals with judiciary. There shall be a Supreme Court of India, consisting of a Chief Justice of India, other Judges Art. 124(1). The parliament has the power to increase the number of judges.

A judge of the Supreme Court is to be appointed by the President after consultation with the Chief Justice of the Supreme Court and shall hold office until the age of sixty-five and can be removed from office by the

President, only after an address by each house of Parliament supported by more than two-thirds majority of members present and voting.

The Supreme Court has both original and appellate jurisdiction. The original jurisdiction is limited to questions between the Government of India and the States, or between the States inter se and to such other questions which involve "the existence or the extent of a legal right" (Art. 131). The Appellate Jurisdiction extends over all the High Courts in India (Art. 132).

The Attorney General. The President shall appoint a person who is qualified to be appointed as a judge of the Supreme Court, to advise the Government of India on legal matters (Art. 76). He has the right to speak and otherwise to take part in the proceedings of either House and to be a member of any Parliamentary Committee but is not entitled to vote (Art. 88).

The Comptroller General. There shall be a Comptroller and Auditor General of India who shall be appointed by the President. He shall only be removed from office in like manner and on the like grounds as a Judge of the Supreme Court (Art. 148)(1). He exercises a general control over the accounts of the Union and State Governments (Art. 149). He is not eligible for further office either of the Union or State governments, once he has retired [Art. 148(4)]

Election Commission is to supervise and control all matters relating to elections to the Parliament and State Assemblies and to the offices of the President and Vice-President (Art. 324). The Election Commission may consist of the Chief Election Commissioner and such other Election Commissioners as the President may appoint from time to time. When any other Election Commissioner is appointed, the Chief Election Commissioner shall function as the Chairman of the Election Commission. The Chief Election Commissioner cannot be removed from office except in the same manner and on the same grounds as a judge of the Supreme Court (Art. 324).

State Governments. The system of Government in States closely follows the pattern of the Union Government. The expression 'State' does not include the State of Jammu and Kashmir, unless otherwise indicated (Art. 152)

The Governor of a State is the Executive head of the State government (Arts. 155 and 156). He is assisted by a Council of Ministers, with the Chief Minister at the head (Art. 163). The Chief Minister is to be appointed by the Governor and other Ministers are to be appointed on the advice of the Chief Minister.

The Legislature of a State shall consist of the Governor and one or two houses of legislature, as the case may be (Art. 108). The following States have two Houses, the Legislative Council (Vidhan Parishad) and the Legislative Assembly (Vidhan Sabha); Bihar, Madhya Pradesh, Tamil Nadu, Maharashtra, Karnataka and UP. The Legislative Assembly of a State may consist of not more than 500 and not less than 60 members (Art. 170). The total number of members in the Legislative Council, if any, shall not exceed one-third of the total number of members in the Assembly (Art. 171).

There shall be a High Court for each State, consisting of a Chief Justice and such other judges as the President may appoint (Arts. 214 and 216). A judge of the High Court can be removed from office by the President, in the same manner as he may remove a judge of the Supreme Court (Art. 217). The High Courts have original jurisdiction in such matters as writs and appellate jurisdiction over all subordinate courts in their jurisdiction.

Advocate General. Every state shall have an Advocate General to advise the Government on legal matters (Art. 165).

Union Territories. The Union Territories ordinarily have no Council of Ministers or legislatures of their own. But the Parliament may by law create for any of the Union Territories of Goa, Daman & Diu, Pondicherry and Mizoram a body, whether elected or partly elected and partly nominated to function as a legislature for the Union Territory or a Council of Ministers or both (Art. 239A).

Official Language. Article 343 of the Constitution provides that the official language of the Union shall be Hindi in the Devanagari script and the form of numerals for official purposes, shall be the international form of Indian numerals; in other words, the Arabic numerals. English, which was originally to continue as the official language only upto Jan. 26, 1965, will under the Official Lan-

guages Act, 1963 continue to be used even after that date in addition to Hindi.

Amendment. Art. 368 deals with amendment of the Constitution. A Bill for Amendment must be passed in each House by a majority of the total membership of that House and by a majority of not less than two-thirds of the members present and voting.

Amendments to certain parts of the Constitution, however, require ratification of the Legislatures of not less than one-half of the States by resolutions to that effect.

Schedules. There are Ten Schedules to the Constitution, the ninth being added by the First Amendment to the Constitution in 1951 and the 10th by the 52nd Amendment in 1985.

First Schedule (under Articles 1 and 4) gives a list of the States and Territories comprising the Union.

States: 1. Andhra Pradesh, 2. Assam, 3. Bihar, 4. Gujarat, 5. Kerala, 6. Madhya Pradesh, 7. Tamil Nadu, 8. Maharashtra, 9. Karnataka, 10. Orissa, 11. Punjab, 12. Rajasthan, 13. Uttar Pradesh, 14. West Bengal, 15. Jammu and Kashmir, 16. Nagaland, 17. Haryana, 18. Himachal Pradesh, 19. Manipur, 20. Tripura, 21. Meghalaya, 22. Sikkim.

Union Territories: 1. Delhi, 2. Andaman and Nicobar Islands, 3. Laccadive, Minicoy and Amindivi Islands, 4. Dadra and Nagar Haveli, 5. Goa, Daman and Diu, 6. Pondicherry, 7. Chandigarh, 8. Mizoram, 9. Arunachal Pradesh.

Second Schedule under Arts. 59(3), 65(3), 75(6), 97, 125, 148(3), 158(3)] consists of 5 Parts A to E.

Part A fixes the remuneration and emoluments payable to the President and Governors. The following emoluments per mensem shall be paid to the President: Rs. 10,000. Governor of State: Rs. 5,500. The President and the Governors of the States shall also be paid such allowances as were payable respectively to the Governor General of India and the Governors of the corresponding provinces immediately before the commencement of this Constitution. **Part B** has been deleted by the Constitution (Seventh Amendment) Act of 1956. **Part C** contains provisions as to the Speaker and the Deputy Speaker of the House of the People and the Chairman and the Deputy Chairman of the

Council of States and the Speaker of the Legislative Assembly and the Chairman and the Deputy Chairman of the Legislative Council. **Part D** contains provisions as to emoluments of the judges of the Supreme Court and of the High Courts. Chief Justice of the Supreme Court per mensem Rs. 5,000. Any other judge of the Supreme Court per mensem Rs. 4,000. Chief Justice of High Courts per mensem Rs. 4,000. Any other judge of High Courts per mensem Rs. 3,500. **Part E** contains provisions as to the Comptroller and Auditor General of India. Pay per mensem Rs. 4,000.

Third Schedule (under Arts. 75(4), 99, 124(6), 148(2), 164(3), 188 and 219) contains forms of *Oaths and Affirmations*.

Fourth Schedule [under Arts. 4(1) and 80(20)] allocates seats for each State and Union Territory, in the Council of States.

Fifth Schedule [under Art. 244(1) provides for the administration and control of Scheduled Areas. This schedule provides for amendment by a simple majority of Parliament and takes it out of the ambit of Art. 368 (Amendment of the Constitution).

Sixth Schedule [under Arts. 214(2) and 275(1)] provides for the administration of Tribal Areas in Assam, Meghalaya and Mizoram. This is a lengthy schedule which goes into the details of the administration in the Tribal Areas concerned. This schedule can also be amended by a simple majority of Parliament.

Seventh Schedule (under Art. 246) gives three Lists: 1. **Union List** contains 97 subjects in which the Union government has exclusive authority. 2. **State List** contains 66 subjects which are under the exclusive authority of State government. 3. **Concurrent List** contains 47 subjects, where the Union and States have concurrent powers.

Eighth Schedule [under Arts. 344(1) and 351(1)] gives a list of 15 languages recognised by the Constitution: 1. Assamese, 2. Bengali, 3. Gujarati, 4. Hindi, 5. Kannada, 6. Kashmiri, 7. Malayalam, 8. Marathi, 9. Oriya, 10. Punjabi, 11. Sanskrit, 12. Sindhi, 13. Tamil, 14. Telugu, 15. Urdu.

Ninth Schedule [under Art. 31(B)] was added by the Constitution (First Amendment) Act 1951. It contains Acts and orders relating to land tenures, land tax, railways, industries, etc. passed by the State govern-

ments, and the Union government which are beyond the jurisdiction of civil courts.

The relevant Art. 31(B) reads as follows: "None of the Acts and Regulations specified in the Ninth Schedule, nor any of provisions thereof shall be deemed to be void or ever to have become void on the ground that such Act, Regulation or Provision is inconsistent with or takes away or abridges any of the rights conferred by any provisions of this part

and notwithstanding any judgement, decree or order of any court or tribunal to the contrary, each of the said Acts and/or Regulations shall, subject to the power of any competent Legislature to repeal or amend it continue in force."

Tenth Schedule [under Articles 101, 102, 191 and 192) was added by the constitution (52nd Amendment) 1985. It contains the Anti-defection Act.

99. THE AMENDMENTS

With the passage of Anti-defection Act, 1985, the number of constitution Amendments has reached 52. As in the case of the American Constitution, some of the amendments have become better known than the constitutional provisos themselves. One of the peculiar features of the Indian Constitution is that various parts of it call for various processes of amendments.

The methods of amendment are three, according to the subject matter of the Article concerned. 1) Articles that may be amended by a simple majority of Parliament. These are mainly matters of detail like those provided in the Schedules. 2) Articles that may be amended by a two-thirds majority of both houses of Parliament. These are comparatively important matters. 3) Articles that require not only a two-thirds majority of Parliament but also ratification by at least one-half of the State Legislatures.

These are specifically mentioned. They are the following: Articles concerning the election of the President (Arts. 54 & 55), the powers of the Union Cabinet (Art. 73), the powers of State Cabinets (Art. 162), the High Courts in Union Territories (Art. 241), the establishment of the Supreme Court (Ch. IV, Part V), Constitution and powers of the High Courts (Ch. V, Part VI), Relations between the Union & State Legislatures (Ch. 1, Part XI), the Lists—Union List, State List and Concurrent List—in the Seventh Schedule, the representation of States in Parliament and the provisions of Article 368 itself (Part XX).

Procedure. Article 368 (Part XX) lays down the general procedure for Amendments. But Articles that require only a simple majority in Parliament do not fall in this category. Such Articles are indicated by a

special clause attached to each of them which specifically excludes the operation of Art. 368 (see Art. 21, Sixth Schedule). Amendment of all other Articles comes within the scope of Art. 368.

Amendments. Starting with the First (Constitution) Amendment Act 1951 we have come down to the 52nd Amendment in 1985. This works out at an average of $1\frac{1}{2}$ amendments per year. We give below a serial list of Amendments for all the years between 1951 and 1985.

1951: 1st Amendment; 1952: 2nd; 1954: 3rd; 1955: 4th and 5th; 1956: 6th and 7th; 1959: 8th; 1960: 9th; 1961: 10th and 11th; 1962: 12th, 13th and 14th; 1963: 15th and 16th; 1964: 17th; 1966: 18th, 19th and 20th; 1967: 21st; 1969: 22nd and 23rd; 1971: 24th, 25th, 26th and 27th; 1972: 28th, 29th and 30th; 1973: 31st and 32nd; 1974: 33rd, 34th and 35th; 1975: 36th, 37th, 38th and 39th; 1976: 40th, 41st and 42nd; 1977: 43rd; 1978: 44th; 1980: 45th; 1982: 46th; 1984: 47th, 48th, 49th, 50th and 1985: 51st and 52nd.

1. Constitution (First Amendment) Act, 1951. Besides making minor changes in Articles 15, 19, 85, 87, 174, 176, 341, 342, 372 and 375 this Act added two new Articles, 31-A and 31-B and a new Schedule, the 9th Schedule.

This amendment has permitted reasonable restrictions to be imposed by law on the exercise of the right of freedom of speech

and expression in the interest of friendly relations with foreign States, or public order. It has also removed from the scope of judicial review, restrictions imposed on the right of citizens to carry on any trade, business, industry or service where such restrictions have been imposed with a view to enabling the State to undertake any scheme of nationalisation.

Another clause of the Amendment authorises the State to make special provision for the advancement of any socially and educationally backward class of citizens or for the Scheduled Castes and the Scheduled Tribes.

Two new Articles 31-A and 31-B were inserted. Article 31-A provides that no law providing for the acquisition by the State of any estate or of any rights therein or for the extinguishment or modification of any such rights shall be deemed to be void on the ground that it is inconsistent with, or takes away or abridges any of the rights conferred by any provision of this Part III.

Article 31-B provides that none of the Acts and Regulations specified in the Ninth Schedule nor any of the provisions thereof shall be deemed to be void, or even to have become void on the ground that such Act, Regulation or provision is inconsistent with, or takes away or abridges any of the rights conferred by any provisions of Part III and notwithstanding any judgement, decree or order of any court or tribunal to the contrary, each of the said Acts and regulations shall continue in force.

2. Constitution (Second Amendment) Act, 1952, amended Article 81 with a view to readjusting the scale of representation in the House of the People, necessitated by the completion of the 1951 census.

3. Constitution (Third Amendment) Act, 1954, substituted entry 33 of the Concurrent List in the 7th Schedule by a new one including foodstuffs, cattle fodder, raw cotton and jute as additional items whose production and supply can be controlled by the Central Govt. if found expedient in the public interest.

4. Constitution (Fourth Amendment) Act, 1955. The Amendment provides that when the State compulsorily acquires private property for a public purpose, the scale of compensation prescribed by the authorising

legislation could not be called in question in a court. Another clause excludes the temporary taking over of a property by the State, either in public interest or to secure its better management, from the compensation clause. The amendment also operates as a saving clause for State monopolies. Seven new entries were also added to the 9th Schedule.

5. Constitution (Fifth Amendment) Act, 1955, empowers the President to fix a time limit for State Legislatures to express their views on proposed Central laws affecting the area and boundaries etc. of their respective States.

6. Constitution (Sixth Amendment) Act, 1956, added a new entry to the Union List in the Seventh Schedule relating to taxes on the sale and purchase of goods in the course of Inter-State transactions.

7. Constitution (Seventh Amendment) Act, 1956. This act came into force on 1st Nov. 1956. It was passed for the reorganisation of the States. It involved not only the establishment of new States and alterations in State boundaries but also the abolition of the three categories of the States and the classification of certain areas as Union Territories. This led to the amendment of Article 1 and the First Schedule of the Constitution. Among the other important Articles which were affected by this amendment were Article 131 on the original jurisdiction of the Supreme Court, Article 168 providing for bicameral legislature in certain States and Articles 216, 217, 220 and 224 dealing with the High Courts. Two new Articles 340-A and 350-B were added with a view to implementing the recommendations of the States Reorganisation Commission regarding constitutional safeguards for linguistic minorities.

8. Constitution (Eighth Amendment) Act, 1959, extended the special provision relating to reservation of seats for the Scheduled Tribes and representation of Anglo-Indians in the House of the People and Legislative Assemblies of States, for a further period of ten years from Jan. 26, 1960.

9. Constitution (Ninth Amendment) Act, 1960, amended the first Schedule to the Constitution in order to give effect to the transfer of certain territories to Pakistan in pursuance of the agreements entered into between the Governments of India and Pakistan in Sept. 1958.

10. Constitution (Tenth Amendment) Act, 1961, incorporated former Portuguese enclaves of Dadra and Nagar Haveli within India and provided for their administration by the President.

11. Constitution (Eleventh Amendment) Act, 1961, obviated the necessity of a joint meeting of the two Houses of Parliament by forming them into an electoral college for the election of Vice-President. It also amended Art. 71 so as to make it clear that the election of the President or the Vice-President shall not be challenged on the ground of any vacancy, for whatever reason, in the appropriate electoral college.

12. Constitution (Twelfth Amendment) Act, 1962. The twelfth amendment was passed to include the territories of Goa, Daman and Diu as a Union Territory in the First Schedule to the Constitution and to empower the President to make regulations for the peace, progress and good government of these areas.

13. Constitution (Thirteenth Amendment) Act, 1962, created Nagaland as the sixteenth State in the Indian Union.

14. Constitution (Fourteenth Amendment) Act, 1962, conferred necessary legislative powers on Parliament to enact laws for the creation of Legislature and Council of Ministers in Union Territories. Former French establishments of Pondicherry, Karaikal, Mahe and Yanam were specified in the Constitution as the Union Territory of Pondicherry.

15. Constitution (Fifteenth Amendment) Act, 1963, was a minor amendment empowering the President of India, in consultation with the Chief Justice of India to make final decisions on the dispute about a High Court Judge's age. It also shortened the procedure for disciplinary action against State employees.

16. Constitution (Sixteenth Amendment) Act, 1963, empowered the State to enact any legislation, imposing reasonable restrictions on the exercise of fundamental rights by citizens, so as to protect the sovereignty and integrity of India.

It also amended the forms of oath, provided in the Third Schedule.

17. Constitution (Seventeenth Amendment) Act, 1964, provided that if the State acquires

land under the personal cultivation of the owner and within the ceiling limit, compensation had to be paid at the market value of the property so acquired. The amendment also extended the protection of the 9th Schedule to 64 State land enactments.

18. Constitution (Eighteenth Amendment) Act, 1966, provided for the linguistic reorganisation of the Punjab into a Punjabi-speaking State called Punjab and a Hindi-speaking State called Haryana.

It further provided that the word 'state' in cls. (a) to (e) of Art. 3 includes a Union Territory and clarified that Parliament had the power to form a new State or Union Territory by combining any part of a State or Union Territory with any part of any other State or Territory.

19. Constitution (Nineteenth Amendment) Act, 1966, is a minor amendment clarifying the duties of the Election Commission.

20. Constitution (Twentieth Amendment) Act, 1966, validates the appointment of certain District Judges, irregularly appointed.

21. Constitution (Twenty-first Amendment) Act, 1967, provided for the inclusion of Sindh in the Eighth Schedule to the Constitution.

22. Constitution (Twenty-second Amendment) Act, 1969, empowered Parliament to carve a new State (Meghalaya) out of Assam.

23. Constitution (Twenty-third Amendment) Act, 1969, provided for the extension of the reservation of seats for Scheduled Castes and Tribes and the nomination of members of the Anglo-Indian community for another 10 years.

24. Constitution (Twenty-fourth Amendment) Act, 1971, affirmed the Parliament's power to amend any part of the Constitution, including Fundamental Rights by amending Articles 368 and 13 of the Constitution. This neutralised the decision in Golaknath case.

A peculiar feature of the Amendment was that the President was bound to give his assent to amending Acts, when they were presented to him, thus making Presidential assent an automatic act.

25. Constitution (Twenty-fifth Amendment) Act, 1971, barred the jurisdiction of courts over acquisition laws in regard to the adequacy of the amount paid in lieu of take-over. The word "compensation" in the case of

take-over was deleted and the word "amount" substituted.

A new clause provided that if any law was passed to give effect to the Directive Principles contained in clauses (b) and (c) of Article 39 and contained a declaration to that effect, it shall not be questioned on the ground that it takes away or abridges Fundamental Rights or on the ground that it does not give effect to the principles contained in the declaration.

26. Constitution (Twenty-sixth Amendment) Act, 1971. This Amendment withdrew the recognition given to former rulers of Princely States and abolished the privy purses granted to them.

27. Constitution (Twenty-seventh Amendment) Act, 1971. Under this Amendment two new Union Territories, Mizoram and Arunachal Pradesh, were set up.

28. Constitution (Twenty-eighth Amendment) Act, 1972. The Amendment deleted Article 314 of the Constitution, which gave protection to the ICS officers' conditions of service and privileges.

29. Constitution (Twenty-ninth Amendment) Act, 1972. This Amendment included the Kerala Land Reforms (Amendment) Act, 1969 and the Kerala Land Reforms (Amendment) Act, 1971, in the Ninth Schedule to the Constitution so as to protect these Acts from judicial review.

30. Constitution (Thirtieth Amendment) Act, 1972. This Amendment curtailed the number of appeals to the Supreme Court. Formerly appeals to the Supreme Court were decided on the basis of the valuation of the subject matter. The Amendment made only such cases which involve a substantial question of law, appealable to the Supreme Court.

31. Constitution (Thirty-first Amendment) Act, 1973, increased the upper limit of elective seats in the Lok Sabha from 525 to 545.

32. Constitution (Thirty-second Amendment) Act, 1973, implemented the 6-point programme for Andhra Pradesh.

33. Constitution (Thirty-third Amendment) Act, 1974, invalidated the acceptance of resignations by members of the State Legislatures and Parliament, which were made under duress or coercion, or any other kind of involuntary resignations.

34. Constitution (Thirty-fourth Amendment) Act, 1974, provided constitutional protection to 20 land reform Acts passed by the various States, by including them in the 9th Schedule to the Constitution.

35. Constitution (Thirty-fifth Amendment) Act, 1974, provided for Associate State status to Sikkim.

36. Constitution (Thirty-sixth Amendment) Act, 1975, made Sikkim a State of the Indian Union—the 22nd State, in fact.

37. Constitution (Thirty-seventh Amendment) Act, 1975, provided for a Legislative Assembly and a Council of Ministers for the Union Territory of Arunachal Pradesh.

38. Constitution (Thirty-eighth Amendment) Act, 1975, amended Arts. 113, 213, 289 B, 352, 356, 359 and 360 of the Constitution. It made the declaration of Emergency by the President and the promulgation of Ordinances by the President, Governors, and Administrative Heads of Union Territories non-justiciable (beyond the purview of the judiciary).

It laid down that the satisfaction of the President, Governor or Authority as to the necessity of immediate action shall be final and shall not be questioned by any court on any ground. It also entitled the President to issue different proclamations on different grounds.

39. Constitution (Thirty-ninth Amendment) Act, 1975, amended Arts. 71 and 329 of the Constitution and the Ninth Schedule. It placed the election of the President, Vice-President, Prime Minister and the Speaker beyond judicial scrutiny.

It provided for a new forum for the disposal of election questions relating to the incumbents of the four high offices—the President, Vice-President, Prime Minister and Speaker.

When a person has been appointed Prime Minister or chosen as a Speaker during the pendency of an election petition in respect of his (or her) election such petition shall abate. His (or her) election will remain valid, notwithstanding any law made by Parliament before the commencement of the Constitution (Thirty-ninth Amendment) Act, 1975 in so far as it relates to elections. Such elections shall not be deemed to be void or ever to have become void on any ground whatsoever.

40. Constitution (Fortieth Amendment) Act, 1976, amended Art. 297 and declared that "all land, minerals and other things of value underlying the ocean within the territorial waters or the continental shelf or the exclusive economic zone of India shall vest in the Union and shall be held for the purpose of the Union."

"The limits of the territorial waters, the continental shelf, the exclusive maritime zone or other maritime zones of India shall be such as may be specified from time to time by or under any law made by Parliament".

41. Constitution (Forty-first Amendment) Act, 1976, raised the retiring age of State Public Service Commission members from 60 to 62. This does not affect the members of the Union Public Service Commission who retire at the age of 65.

42. Constitution (Forty-second Amendment), Act, 1976, was passed by Parliament on November 2, and after having been ratified by half of the State Assemblies received Presidential assent on December 18, 1976. The Amending Act is a piece of comprehensive legislation containing 59 clauses and touching upon varied constitutional questions.

The main features of the Amending Act may be summarised as follows:

1. The Preamble has been altered from 'sovereign democratic republic' to 'sovereign socialist, secular democratic republic' and 'unity of the nation' into 'unity and integrity of the nation'.

2. The Directive Principles of the Constitution have been given precedence over Fundamental Rights, wherever they came into conflict.

3. Similarly prevention or prohibition of anti-national activities takes precedence over Fundamental Rights.

4. Certain Fundamental Duties are laid down which have to be observed by all citizens. Non-compliance with or refusal to observe the duties shall be punishable at law. No court shall question the validity of such actions.

5. Number of seats in the Lok Sabha and the State Assemblies which are based on population shall remain frozen as in the 1971 census till 2001 A.D., that is to say, for 2 more Decennial Censuses.

6. The duration of the Lok Sabha and the

State Assemblies is increased from 5 to 6 years.

7. The quorum for the Lok Sabha and the State Assemblies prescribed in the Constitution has been removed which means that a quorum is no longer a constitutional necessity.

8. The Parliament may decide what offices are offices of profit under the government or what amounts to corrupt practice in disqualifying an elected member from any house of legislature.

9. Rights and privileges of members and committees of legislatures are to be decided by the concerned houses from time to time.

10. Proclamation of Emergency may be made applicable to any part of the country (instead of the whole country). Similarly emergency can be lifted from any part of the country while it remains in force in other parts.

11. The duration of a Presidential proclamation taking over the government of a State shall be one year instead of six months.

12. The Union has the power to deploy armed forces to any State and to delimit cantonment areas in States. The State cannot exercise any power in the disposition of the armed forces or the administration of cantonment areas.

13. No court can question the competence of the Parliament to amend the constitution in any manner.

14. The Supreme Court alone can adjudicate on the validity of any Central law and the High Courts can adjudicate on the validity of the state laws. If the validity of any State law is dependent of the validity of any Central law or vice versa, then the Supreme Court can adjudicate on them. In any case, any decision on constitutional invalidity has to be made by a two-thirds majority of sitting judges where the number is not less than 5. If the number of judges is less than five the judgement has to be unanimous. It is also provided that the High courts have no power to make an interim order, where it will impede or obstruct any enquiry or action by the Government.

15. The President's liability to act in accordance with the advice of the Council of Ministers has been made practically mandatory.

43. Constn. (Forty-third Amendment) Act, 1977 which received Presidential assent on April 3, 1978 (i) omits some Articles added by the Forty-second Amendment and (ii) alters other Articles.

The omissions relate to articles that give unfettered authority to the Executive or eliminate or restrict the powers of the Supreme Court and High Courts. The alterations apply to Arts. 145, 226, 228 and 366.

All these omissions and alterations imply that the constitution has reverted to the position that prevailed before the passing of the Forty-second Amendment, at least in matters specifically referred to in the Amendment.

44. Constn. (Forty-fourth Amendment) Act, 1978 which received Presidential assent on April 30, 1979 brought in a number of changes. These apply to the following: Arts. 19, 22, 30, 31, 31A, 31C, 38, 71, 74, 77, 83, 103, 105, 123, 132, 133, 134A, 139A, 150, 165, 172, 192, 194, 213, 217, 226, 227, 239B, 257A, Chapter IV, Part XX, 329, 329A, 352, 356, 358, 359, 360, 361, 371F, Ninth Schedule and Forty-second Amendment Sections 18, 19, 21, 22, 31, 32, 34, 35, 56 and 59.

Of these Arts. 19, 31, 31A, 31C, 38, 77, 83, 105, 123, 132, 133, 134A, 139A, 150, 165, 194, 213, 217, 225, 226, 227, 239B, 257A, 329, 329A, 371F and Sections 18 to 59 of Forty-second Amendment itself are either omissions or deal with details or are comparatively unimportant. Others deserve notice.

Art. 22. This article deals with preventive detention. The important change is that preventive detention for a period of more than 2 months can be ordered only on the recommendation of an Advisory Board, whose Chairman shall be a judge of a High Court.

Art. 30. The Amendment of this article reads as follows:

In article 30 of the Constitution, after clause (1), the following clause shall be inserted, namely:-

"1A). In making any law providing for the compulsory acquisition of any property of an educational institution established and administered by a minority, referred to in clause (1), the State shall ensure that the amount fixed by or determined under such law for the acquisition of such property is such as

would not restrict or abrogate the right guaranteed under that clause."

Art. 71. This Art. deals with questions relating to the election of President or Vice-President. The amended article reads:

"71 (1). All doubts and disputes arising out of or in connection with the elections of a President or Vice-President shall be inquired into and decided by the Supreme Court whose decision shall be final.

(2) If the election of a person as President or Vice-President is declared void by the Supreme Court, acts done by him in the exercise and performance of the powers and duties of the office of President or Vice-President, as the case may be, on or before the date of the decision of the Supreme Court shall not be invalidated by reason of that declaration.

(3) Subject to the provisions of this Constitution, Parliament may by law regulate any matter relating to or connected with the election of President or Vice-President.

(4) The election of a person as President or Vice-President shall not be called in question on the ground of the existence of any vacancy for whatever reason among the members of the electoral college electing him."

Art. 74 deals with the powers of the President vis-a-vis the Cabinet. The amended article is as follows:

In article 74 of the Constitution, in clause (1), the following proviso shall be inserted at the end, namely:—

"Provided that the President may require the Council of Ministers to reconsider such advice, either generally or otherwise, and the President shall act in accordance with the advice tendered after such reconsideration."

Art. 83 restores the old term of 5 years to the Lok Sabha.

Art. 103 relates to questions concerning the disqualification of a member of Parliament. This is now to be decided by the President after consultation with the Election Commission.

Art. 172 restores the 5-year term of State Legislatures.

Art. 192 relates to the disqualification of a member of a State Legislature. This is now to be decided by the Governor after consulta-

tion with the Election Commission.

Chapter IV Part XX is an addition. The amendment reads:

In Part XII of the Constitution, after Chapter III, the following Chapter shall be inserted, namely:—

Chapter IV—Right to Property.

300 A. "No person shall be deprived of his property save by authority of law".

Arts. 352, 356, 358, 359 and 360 deal with Emergency. An internal emergency can now be declared on "armed rebellion" breaking out and not for "internal disturbance". Other provisions relating to the emergency in Art. 356, 358, 359 and 360 have also been substantially altered.

Art. 361 restores protection to publications of proceedings of the Parliament and State Legislatures.

Ninth Schedule entries 87, 92 and 130 have been deleted.

45. Const. (Forty-fifth Amendment) Act, 1980, passed by Parliament on the 25th of January 1980.

Amended article 334 of the Constitution by substituting "thirty years" with "forty years".

This was to extend the safeguards in respect of reservation of seats in Parliament and State Assemblies for Scheduled Castes and Scheduled Tribes as well as for the Anglo-Indians for a period of 10 years, i.e., upto January 29, 1990.

46. The Constitution (Forty-sixth Amendment) Act, 1982—Article 269 was amended so that the tax levied on the consignment of goods in the course of inter-state trade or commerce shall be assigned to the states. This article was also amended to enable Parliament to formulate by law principles for determining when a consignment of goods takes place in the course of inter-state trade or commerce. A new entry 92B was also inserted in the Union List to enable the levy of tax on the consignment of goods where such consignment takes place in the course of inter-state trade or commerce.

47. The Constitution (Forty-seventh Amendment) Act, 1984—This amendment is intended to provide for the inclusion of certain land reform Acts in the Ninth Schedule to the Constitution with a view of obviating the scope of litigation hampering the imple-

mentation process of those acts.

48. The Constitution (Forty-eighth Amendment) Act, 1984—This was an amendment to Clause 5(q) article 356 of the Constitution for the continuation of President's rule in Punjab for another year.

49. The Constitution (Forty-ninth Amendment) Act, 1984—The Government of Tripura recommended that the provisions of the Sixth Schedule to the Constitution may be made applicable to the tribal areas of that state. The amendment involved in this Act is intended to give a constitutional security to the autonomous District Councils functioning in the state.

50. The Constitution (Fiftieth Amendment) Act, 1984—By article 33 of the Constitution, Parliament is empowered to enact laws determining to what extent any of the rights conferred by Part III of the Constitution shall, in their application to the members of the Armed Forces or the Forces charged with the maintenance of public order, be restricted or abrogated so as to ensure the proper discharge of their duties and the maintenance of discipline among them.

Article 33 was amended so as to bring within its ambit—

(i) the members of the Forces charged with the protection of property belonging to, or in the charge or possession of, the State; or

(ii) Persons employed in any bureau or other organization established by the State for purposes of intelligence or counter intelligence; or

(iii) Persons employed in, or in connection with, the telecommunication systems set up for the purposes of any Force, bureau or organisation.

51. The Constitution (Fifty-first Amendment) Act, 1985, replaces the section dealing with "Scheduled Castes and Scheduled Tribes except in tribal areas of Assam, Nagaland, Meghalaya, Arunachal Pradesh and Mizoram" with "the Scheduled Tribes except the Scheduled Tribes in the autonomous district of Assam"—in articles 330 and 332.

52. The Constitution (Fifty-second Amendment) Act, 1985. The amendment effected by a Bill popularly called Anti-Defection Bill, was to curb defection by disqualification.

The following are the salient features of the Act:-

(1) A Member of Parliament or State Legislature belonging to any political party shall be disqualified for being a member of that House:

(a) if he has voluntarily given up his membership of such political party; or (b) if he votes or abstains from voting in such House contrary to any direction issued by the political party to which he belongs or by any person or authority authorized by it in this behalf without obtaining in either case, the prior permission of such political party, persons or authority, and such voting or abstention has not been condoned by such

political party, person or authority within 15 days from the date of such voting or abstention.

(2) An elected member of a House who has been elected as such otherwise than as a candidate set up by any political party shall be disqualified for being a member of the House if he joins any political party after such elections.

(3) A nominated member of a House shall be qualified for being a member of the House if he joins any political party after the expiry of six months from the date on which he takes his seat after complying with the requirements of Articles 99 or, as the case may be, Article 188.

100. POLITICAL PARTIES

The Party System in India has developed on lines quite dissimilar to those which obtain in Western democracies. The main trends noticeable in India are absence of polarisation or the lack of a powerful opposition, a cleavage of parties on national and state bases and endless proliferation.

The main reason why a polarisation of parties never took place in India was that the Indian National Congress had completely dominated the national scene. Besides, the Opposition itself had only a nominal existence in Parliament. In fact, till 1970, the Opposition leader was not even formally recognised. The first Opposition leader to be recognised as such, was Dr. Ram Subhag Singh, who was the leader of the Opposition Congress when the Congress split in 1970.

When the Janata Party came to power at the Centre in 1977 the Opposition Leader was given the status and rank of a Cabinet Minister. C.M. Stephen of Kerala was the first Opposition Leader to enjoy the status.‡

National & State Parties. Instead of polarising at the national level into ruling and opposition parties, another sort of polarisation took place at national and state levels. Political parties soon came to be classified as national and state parties. The national parties function on an all-India basis.

‡ The Opposition Leader is a fictitious personage in most of the new democracies. In 1964, out of the 113 states who were members of the UN only 30 had a recognised Opposition in Parliament. Since 1964 one-party states have become fashionable and Opposition Leaders as a class appear to be on their way out from history

They are integrative in character and ideologically committed to some form of political philosophy. The state parties have no special ideology. They are usually centered round local leaders and are mainly interested in local questions. Many of these parties are communal in character.

The fortunes of national parties depend very much upon the degree of power that State parties wield in their respective States. But since national parties are better organised and have much greater financial resources, the chances of any State party getting the better of a national party, ultimately, are however rather remote.

Many are hard put to explain why political parties tend to multiply in India at such prodigious rates. During the 30 years that have elapsed, the country has seen a proliferation of political parties such as no other country in the world has witnessed. A rough tally yields a hundred political parties of varied hues and shades that have come into existence since independence.

No Regulation. One explanation that has been offered is that the formation and functioning of political parties in India are not regulated by law.

Of the 100 and odd parties scattered throughout the length and breadth of India, hardly a score deserves notice. The rest is made up of people, who cluster round displaced local leaders or hang on to sheer parochialisms, in the hope that their turn will come some day. Many of them come to life during election time and go into hibernation till the next election. But to the dismay of the voter, they never disappear altogether. They exist only to swell the number of candidates, cloud the issues, and spread confusion all round.

Recognition of Parties. Under the Election Symbols (Reservation & Allotment) order 1968, the Election Commission has the right to recognise political parties for allotment of symbols. Every candidate is allotted a symbol. If a candidate belongs to a political party the symbol is allotted to the party and the candidates use it on behalf of the party.

The symbol is important, a large number of voters being illiterate. They cannot identify the candidates (or the party) whom they support or would like to support by reading their names on the ballot paper or for that matter on placards or bill boards. The only thing that helps them to identify the candidates is the symbol. In fact they vote for the symbol rather than the candidate.

It is the duty of the Election Commission to allot symbols for the various parties and/ or the candidates whenever an election is announced. It is for this purpose that the Election Commission distinguishes between *recognised* and *unrecognised* parties. If a party is recognised, a particular symbol is 'reserved' for it. No other party or person can claim it or use it in the election campaign. Unrecognised parties, which include independent (unattached to any party) candidates, can always choose any symbol other than the reserved symbols.

The list of recognised parties is revised after every general election in the light of the votes polled by them. The general criterion for recognition is that a party should secure at least four per cent of the total votes cast in a State.

If any such political party is treated as a recognised political party in four or more States, it enjoys the status of a National Party throughout the whole of India. If recognised

in less than four States, a party enjoys the status of a 'State Party' in the State or States in which it is a recognised political party.

Proliferation. When India became free there were only two political parties worth the name—the mammoth Indian National Congress and the diminutive Communist Party of India. With independence many new parties came on the scene. When the first elections were held (1951 Dec.—1952 Jan.) as many as 77 parties joined the fray.

The first important development was the breakup of the Communist Party in 1964 into two factions, right and left. The rightists retained the name and goodwill of the old Communist Party of India. The leftists formed a new party—the Communist Party (Marxist).

A more momentous development occurred in 1969. The monolithic Congress Party split into two—the party led by the Prime Minister Mrs. Indira Gandhi and the party led by the Congress president Nijalingappa. In the 1971 elections the Congress Party under Mrs. Gandhi won a massive majority in the Lok Sabha (350) while the party led by Nijalingappa made a poor show winning only a miserable 16 seats.

The most important development in party politics in 1974 was the formation of the *Bharatiya Lok Dal (BLD)* or the *People's Party of India* in August 1974 at Delhi. The new party was formed by the merger of seven existing parties, namely, *Bharatiya Kranti Dal (BKD)*, *Swatantra*, *Samyukta Socialist Party*, *Utkal Congress*, *Kisan Mazdoor Party*, *Rashtriya Lok Tantric Dal* and *Punjab Khetibar Zamindar Sabha*.

United Front. In 1977 Mrs. Gandhi announced fresh elections to the Lok Sabha. The miniscule opposition parties got together to offer a united challenge to the dominating Congress Party. Under Jaya Prakash Narain's inspiring lead the Jana Sangh, the Opposition Congress, the BLD and the newly formed CFD (Congress for Democracy) under Jagjivan Ram came together as the *Janata Party* in May 1977 to offer a united front against the Congress led by Indira Gandhi.

The *Janata Party* won the elections gaining an absolute majority in the Lok Sabha, leaving only 135 seats for the Congress.

The Janata Party turned out to be a nine days wonder. Morarji Desai, the veteran Congress leader, was elected leader of the party. He took over the government as Prime Minister on March 24, 1977. The new ministry put up a big show going into action on many fronts. But the writing on the wall was clear to all who cared to look beneath the surface. The Janata Party had been weighed in the balance and found wanting.

The fault lay in the leaders themselves. Petty infighting kept on returning like the proverbial bad penny. These finally led to the resignation of the Home Minister Charan Singh from the party's national executive and the parliamentary board. The Prime Minister reacted by asking Charan Singh and Raj Narain, the Health Minister, to resign from the cabinet.

The peace-makers intervened. In January 1979, Charan Singh returned to the cabinet as Deputy Prime Minister and Minister for Finance. But Jagjivan Ram, another leader, was also elevated as Deputy Prime Minister at the same time. The patch-work did not last long.

Charan Singh and his followers refused to support Desai as Prime Minister. So he was obliged to resign Prime Ministership in July 1979. But he did not resign from the leadership of the party. In the circumstances Charan Singh formed a new party called Janata (Secular) or Janata (S) for short. Morarji at last resigned the leadership of the party and Jagjivan Ram succeeded him.

Charan Singh and his supporters formed a new ministry while Jagjivan Ram continued as the leader of the Opposition. Charan Singh, however, had to fall back on Mrs. Gandhi's party to maintain the requisite majority. Mrs. Gandhi withdrew her support on August 20, 1979 and the Charan Singh ministry fell.

Tables Turned. However, as Prime Minister he advised the President to dissolve the Parliament and order fresh elections. The President asked Charan Singh to continue in the meantime as Prime Minister of a care-taker government. In view of the coming elections, Charan Singh and Raj Narain formed a new party—Lok Dal. But the two leaders soon fell out. In the elections that followed Mrs. Gandhi came back to power as the leader of the Indian National Congress, more familiarly spoken of as Indira Congress or Congress (I).

In July 1981 the Election Commission recognised Congress (I) as the legitimate successor of the old Indian National Congress and de-recognised the Congress faction led by Devraj Urs (Congress (U)) as a national party. In August Jagjivan Ram replaced Devraj Urs as President and Congress (U) became Congress (J). Subsequently the Maharashtra leader Sharad Pawar became the President of the break-away Congress and Congress (J) transformed itself as Congress (S).

The Janata Party split up, the old Janata continuing with Chandrasekhar as President. The Lok Dal, the original splinter party started by Charan Singh, underwent many changes. It became Janata (K) after its President Karpoori Thakur, DMKP — Dalit Mazdour Kisan Party - under Charan Singh himself and finally returned to hold its old name Lok Dal on the eve of 1985 by-election. However, the major element in the old Janata Party, the Jana Sangh, gathered together under a new banner, the Bharatiya Janata Party, with A.B. Vajpayee as President. Meanwhile, a brand new party appeared on the horizon, the Democratic Socialist Party, with H.N. Bahuguna as President. Bahuguna became Vice President of Lok Dal in 1985.

101. ELECTIONS

The General Elections to the national Parliament and State Assemblies were held simultaneously till 1970. In 1971 this policy was given up. The national and State elections were 'de-linked' and held separately.

Although no explanation has been offered for this departure in policy, it was probably the clash of interests between national and

state parties that prompted this change. **First General Election 1952.** In the first general election held in 1952, fiftyone parties

contested out of which 21 entered the Lok Sabha.

Second General Election 1957. At the second general election, the Congress secured 371 out of 494 elective seats in the Lok Sabha.

Third General Election 1962. Out of 494 parliamentary seats the Congress won 361.

Fourth General Election 1967. At the fourth general election, the performance of the Congress party was comparatively poor. It secured only 283 seats out of 520.

Fifth General Election 1971. This was a mid-term election, the Lok Sabha having been dissolved on Dec. 27, 1971, one year and two months before the expiry of the full period. The results of the elections were startling. The Ruling Congress, under Indira Gandhi, swept the polls and came out with a massive majority of 350 out of 518 elective seats in the Lok Sabha.

On the 26th of June 1975 the President declared an Emergency. This emergency was lifted only after the results of the Sixth General Election were announced, namely on the 22nd March, 1977.

During the emergency, the term of the Lok Sabha was extended to 6 years by the 42nd amendment. This extension was annulled by the 43rd amendment in 1977 and the old term of 5 years was restored.

Sixth General Election 1977. The 6th General Elections (March 1977) brought the Janata government to power. Janata won more than 296 seats in a total of 542—a clear majority—while the Congress could muster only 153 seats.

Seventh General Election 1980. The 7th General Elections (January 1980) returned Indira Gandhi to power again with a two-thirds majority in the Lok Sabha. The Congress (I) won 353 seats in a total of 542.

Seventh Lok Sabha

Party position as on March 1st, 1980

Congress (I)	353
Janata (S)	42
CPI(M)	36
Janata	31
DMK	16
Other parties	38
Unattached	12
Total	528
Vacant seats	16
Grand Total	544

Eighth General Election 1984. Polling was held on 24th, 27th and 28th December 1984 in 508 constituencies. In a landslide victory the ruling Congress(I) under Rajiv Gandhi secured 401 seats.

Elections to five Lok Sabha seats were countermanded—following the gas leakage tragedy in Bhopal and the death of candidates in the other four constituencies, viz., Srikakulam and Rajampet (A.P.) Chail (U.P.) and Madras North (Tamil Nadu).

Polling in these 5 constituencies was held on 28-1-1985. Congress (I) won in Chail and Bhopal, Telugu Desam in Srikakulam and Rajampet and DMK in Madras North.

State Elections. The normal term of a State Legislative Assembly is five years, from the date of appointment for its first meeting.* Election to every Legislative Assembly is direct and on the basis of adult suffrage.

The general elections to the State Assemblies, since independence, present a confused picture, primarily because new States and Territories have been created, and many territorial adjustments among the old and the new have been made.

As early as 1953, Andhra Pradesh was carved out in the south. This was followed by the large-scale reorganisation of States in November 1956. Next, the state of Bombay was bifurcated in May 1960 into Maharashtra and Gujarat. The latest reorganisation has come about as a result of the North Eastern Areas (Reorganisation) Act 1971. The North Eastern region of the country now has five States, namely, Assam, Nagaland, Meghalaya, Manipur and Tripura and two Union Territories, namely, Mizoram and Arunachal Pradesh.

Territorial reorganisation has led to consequential changes on the election scene. The composition of State Legislative Assemblies has altered, delimitation of assembly constituencies has been done afresh or readjusted wherever necessary and orders relating to Scheduled Castes and Scheduled Tribes have been modified.

Besides, mid-term elections in various States have added their own confusion. These elections come at odd times upsetting

*The terms of State Assemblies were extended to 6 years by the 42nd Amendments. The 43rd Amendments restored the old period of 5 years.

Party Position in Lok Sabha & Rajya Sabha

As on 1st February 1985

	Lok Sabha	Cong (I)	Telugu Desam	CPI(M)	AIADMK	Janata	CPI	Other Parties	Un-atta ched	Total	Rajya Sabha
Andhra Pradesh	42	6	30	1	—	1	1	2 ¹	1	42	18
Assam *	14	—	—	—	—	—	—	—	—	—	7
Bihar	54	48	—	—	—	1	2	2 ²	1	54	22
Gujarat	26	24	—	—	—	1	—	1 ³	—	26	11
Haryana	10	10	—	—	—	—	—	—	—	10	5
Himachal Pradesh ‡	4	3	—	—	—	—	—	—	—	3	3
Jammu and Kashmir ‡	6	2	—	—	—	—	—	3 ⁴	—	5	4
Karnataka	28	24	—	—	—	4	—	—	—	28	12
Kerala	20	13	—	1	—	1	—	5 ⁵	—	20	9
Madhya Pradesh	40	40	—	—	—	—	—	—	—	40	16
Maharashtra	48	43	—	—	—	1	—	3 ⁶	1	48	19
Manipur	2	2	—	—	—	—	—	—	—	2	1
Meghalaya	2	2	—	—	—	—	—	—	—	2	1
Nagaland	1	1	—	—	—	—	—	—	—	1	1
Orissa	21	20	—	—	—	1	—	—	—	21	10
Punjab *	13	—	—	—	—	—	—	—	—	—	7
Rajasthan	25	25	—	—	—	—	—	—	—	25	10
Sikkim	1	—	—	—	—	—	—	—	1	1	1
Tamil Nadu	39	25	—	—	12	—	—	2 ⁷	—	39	18
Tripura	2	—	—	2	—	—	—	—	—	2	1
Uttar Pradesh	85	83	—	—	—	—	—	2 ⁸	—	85	34
West Bengal	42	16	—	18	—	—	3	5 ⁹	—	42	16
Union Territories						—					
Andaman and Nicobar Islands	1	1	—	—	—	—	—	—	—	1	1
Arunachal Pradesh	2	2	—	—	—	—	—	—	—	2	1
Chandigarh	1	1	—	—	—	—	—	—	—	1	—
Dadra & Nagar Haveli	1	—	—	—	—	—	—	—	1	1	—
Delhi	7	7	—	—	—	—	—	—	—	7	3
Goa, Daman and Diu	2	2	—	—	—	—	—	—	—	2	—
Lakshadweep	1	1	—	—	—	—	—	—	—	1	—
Mizoram	1	1	—	—	—	—	—	—	—	1	1
Pondicherry	1	1	—	—	—	—	—	—	—	1	1
Anglo-Indian (Nominated)	2	—	—	—	—	—	—	—	2	2	—
Nominated by President under section 80(1)(a) of the Constitution	—	—	—	—	—	—	—	—	—	—	12
Total	544	403	30	22	12	10	6	25	7	515	244
											(29 vacant)

1 BJP—1; Con (S)—1

2 Con (I)—1; DMKP—1

3 BJP—1

4 NC(F)—3

9 Forward Bloc—2; RSP—3

‡ Ladakh in Jammu and Kashmir and parts of the Mandi Constituency in Himachal Pradesh which were snow-bound could not have polling along with the rest.

* Elections in Punjab and Assam could not be held since the situation in both States was not conducive

5 Kerala Congress (I)—2, Indian Union Muslim League—2
Congress (S)—1

6 Con (S)—2, PWP—1

7 DMK—2

8 DMKP—2

the statutory pattern of general elections. Between the first general election in 1951-52 and the fifth general election in 1972, there have been as many as 20 mid-term elections in different States.

State General Elections

1st General Election	Dec. 1951-Jan. 1952
2nd :	March 1957
3rd :	Feb. 1962
4th :	Feb. 1967
5th :	Mar.-Apr. 1972

Mid-term Election

Pepsu (Punjab)—Haryana	.. Feb.	1954
Travancore-Cochin (Kerala)	.. Feb.	1954
Andhra Pradesh	.. Feb.	1955
Kerala	.. Feb.	1960
Orissa	.. June	1961
Goa, Daman & Diu	.. Dec.	1963
Nagaland	.. Jan.	1964
Pondicherry	.. Aug.	1964
Kerala	.. Mar.	1965
Haryana	.. May	1968
Bihar	.. Feb.	1969
Punjab	.. "	"
Uttar Pradesh	.. "	"
Nagaland*	.. "	"
West Bengal	.. "	"
Pondicherry	.. Mar.	1969
Kerala	.. Sept.	1970
Orissa	.. Mar.	1971
Tamil Nadu	.. "	"
West Bengal	.. "	"

*Nagaland and Pondicherry have had two general elections, in the normal course, though they were necessarily mid-term. The Legislative Assembly of Nagaland was first constituted in Jan. 1964 and that of Pondicherry in Aug. 1964.

MGP—Maharashtrawadi Gomantak Party
AIADMK—All India Anna Dravida Mannetra Kazhakam
APHLC—All Party Hill Leaders Conference
HSPDP—Hill States People's Democratic Party.

1972 Elections. Sixteen States and two Union Territories held elections in March and one Union Territory (Mizoram) in April, 1972.

Five states and five territories did not go to polls: (1) Kerala (2) Nagaland (3) Orissa (4) T. Nadu (5) UP (States); (1) A & N Islands (2) Lakshadweep (3) Chandigarh (4) D & N Haveli and (5) Arunachal Pradesh (Territories).

Winning Parties 1972

Andhra Pradesh—Ruling Congress (216 out of 287 seats)
Assam—R. Congress (94 out of 114)
Bihar—R.C. (167/318)
Gujarat—R.C. (139/198)
Haryana—R.C. (52/81)
Himachal Pradesh—R.C. (51/65)
Jammu & Kashmir—R.C. (51/65)
Karnataka—R.C. (165/216)
Madhya Pradesh—R.C. (220/296)
Maharashtra—R.C. (223/270)
Manipur—(Manipur People's Party 18, R.C. 17, seats out of 60)
Meghalaya—All party Hill Leaders' Conference (32/60)
Punjab—R.C. (66/104)
Rajasthan—R.C. (145/184)
West Bengal—R.C. (216/280)
Delhi—R.C. (44/56)
Goa, Daman & Diu—Maharashtrawadi Gomantak Party (18/30)
Mizoram—Mizo Union (21/30)

Winning Parties 1977

March Election

Kerala—Ruling Front 111/140. The Ruling Front consisted of 7 parties. Leading Parties: National Congress(I)—38, Kerala Congress—20, CPI—23, Muslim League—13, and RSP (Kerala) 9.

June Election

Bihar—Janata 214/324
Haryana—Janata 75/90
Himachal Pradesh—Janata 53/68
Madhya Pradesh—Janata 230/320
Orissa—Janata 110/147
Punjab—Akali Dal 59/117
Rajasthan—Janata 150/200
Tamil Nadu—AIADMK 130/234
Uttar Pradesh—Janata 351/425
W. Bengal—CPM 178/254
Delhi—Janata 46/56
Goa, Daman & Diu—MGP 15, Congress 10/30
Pondicherry—AIADMK 14, Janata 7/30

Winning Parties 1978

Andhra Pradesh—Cong. (I) 175/294
Assam—Janata 53, Cong. (R) 26/126
Karnataka—Cong. (I) 150/224
Maharashtra—Janata 100, Cong. (R) 69/288
Meghalaya—Cong. (R) 20, APALC 16, HSPDP 14/60
Arunachal Pradesh—Janata 17/30.

Election 1982**Kerala**

Total Seats	140
Congress (I)	20
CPI	13
CPM	26
Cong. (S)	7
Janata	4
Kerala Cong (M)	6
Kerala Cong (J)	8
AIML	4
IUML	14
RSP	4
Independents	34

West Bengal

Total Seats	294
Congress (I)	49
CPM	174
CPI	7
RSP	19
FBL	28
Independents & Others	17

Haryana

Total Seats	90
Congress (I)	36
Lok Dal	31
BJP	6
Janata	1
Independents & Others	12

Himachal Pradesh

Total Seats	68
Congress (I)	31
BJP	29
Janata	2
Independents	6

January 1983**Andhra Pradesh**

Telugu Desam	201
Congress (I)	60
C.P.I.	4
C.P.I.(M)	5
B.J.P.	3
Janata	1
Congress (J)	1
Independents	18
Countermanded	1
Total seats	294

Karnataka

Janata-Ranga front including CPI 3 and CPI(M) (2)	101
Congress (I)	81

B.J.P.	18
Maharashtra Ekikaran Samity	5
A.I.A.D.M.K.	1
Others (including one C.P.I.(M) candidate who contested as an independent	17
Countermanded	1
Total seats	224

Tripura

C.P.I. (M)	37
R.S.P.	2
Congress (I)	12
Ind. (rebel Cong. (I))	3
TUJS*	6
Total seats	60

Delhi

Metropolitan Council	
Total Seats	56
Congress (I)	34
BJP	19
Lok Dal	2
Janata	1
Municipal Corporation	

Total seats	100
Seats declared	94
Congress (I)	55
BJP	34
Lok Dal (C)	3
Janata	1
Independent	1

Nagaland

Total seats	60
Congress (I)	36
N.N.D.P.	23
Independent	1

Assam

Total seats	126
Polling in	108
Congress (I)	89
Congress (S)	2
P.T.C.A.	3
CPM	3
CPI	1
Independents	10

Meghalaya

Total seats	60
Congress (I)	25
A.P.H.L.C.	16
H.S.P.D.P.	13
P.D.I.C.	1
Ind.	5

* Tripura Upajati Juba Samiti

Jammu & Kashmir

Total seats	76
National Conference	47
Congress (I)	26
People's Conference	1
Panthers' Party	1
Independent	1

Tamil Nadu

Total seats	234
AIADMK	133
Congress (I)	62
DMK	22
CPI (M)	5
Janata	3
CPI	2
Gandhi Kamaraj National Congress	2
Indian Union Muslim League	2
Tamil Nadu Forward Bloc	1
All India Forward Bloc	1
Independent	1

Goa, Daman & Diu

Total seats	30
Congress (I)	18
M.G.P.	8
Goa Congress	1
Independents	3

Manipur

Total seats	60
Congress (I)	27
Independents	18
Janata	4
MPP	3
CPI	1
KNA	1
Others	6

Arunachal Pradesh

Total seats	30
Congress (I)	21
People's party of Arunachal Pradesh	4
BJP	1
Independents	4

March 1985

Andhra Pradesh: Total seats 294 (countermanded 2); —Telugu Desam: 202; Congress (I): 49; CPI: 11; CPI(M): 11; BJP: 8; Majlis 3; Janata 2; Ind: 6.

Orissa: Total seats: 147 (Countermanded 2); — Congress (I): 117; Janata: 20; CPI: 1; BJP: 1; SUCI 1; Jagrata Orissa 1; Ind: 4.

Rajasthan: Total seats: 200.

(Countermanded 2); — Congress (I): 113; BJP: 38; Janata: 10; CPI(M): 1; DMKP: 27; Ind: 9.

Himachal Pradesh: Total seats: 68; (elections held for 65); — Congress (I): 55; BJP: 7; DMKP: 1; Ind: 2.

Maharashtra: Total seats: 288; — Congress (I): 162; Cong(S) 54; Janata: 20; BJP: 16; PWP: 13; CPI: 2; CPI(M): 2; Ind: 19.

Bihar: Total seats: 324; (Countermanded 5); — Congress (I): 192. DMKP: 38; Janata 11; BJP: 12; CPI: 12; JMM: 10; Cong.(S): 1; CPI(M): 1; Ind: 21.

Gujarat: Total seats: 182; —Congress (I): 149; Janata: 14; BJP: 11; Ind: 8.

Uttar Pradesh: Total seats: 425 (Countermanded 3); — Congress (I): 266; DMKP: 85; BJP: 16; CPI: 6; CPM: 2; Janata: 19; Cong.(S): 4; Ind: 24; Others: 71.

Karnataka: Total seats: 224; —Janata: 139; Congress (I) 66; CPI: 4; CPI(M): 2; BJP: 2; MES: 3; Ind: 8.

Madhya Pradesh: Total seats: 320; —Congress (I): 250; BJP: 58; Janata: 5; Congress (S): 1; Ind: 6.

Sikkim: Total seats: 32; —SSP: 30; Congress (I) 1; Ind: 1.

Pondicherry: Total seats: 30; —Congress (I): 15; AIADMK: 6; DMK: 5; Janata: 2; Ind: 2.

September 1985**Punjab**

Total seats:	117
Seats declared	115
	(election in two countermanded)
Akali Dal (L)	73
Congress (I)	32
BJP	4
CPI	1
Janata	1
Independents	4

Punjab: Lok Sabha

Total seats	13
Akali Dal (L)	7
Congress (I)	6

December 1985

Assam Assembly

Total seats	125
(excluding one countermanded)	
Asom Gana Parishad (AGP)	64
Congress	25
United Minorities Front (UMF)	17
Congress (S)	4

CPM	2
Plains Tribals Council	
of Assam (PTCA)	3
Independents	10

Assam: Lok Sabha

Total seats	14
Asom Gana Parishad (AGP)	7
Congress	4
United Minorities Front (UMF)	1
Others	2

102. THE YEAR OF ACCORDS

The first year of Rajiv Gandhi as the Prime Minister can well be called the year of historic accords. Within months of his assuming the Prime Ministership with the largest ever mandate from the electorate in December 1984, there were signs of imminent break-throughs in some major issues that had been tormenting the national psyche for long.

And by the time Rajiv completed a full year in office, he had made significant contributions to lasting peace in Gujarat, Punjab, Assam and Mizoram, all of which had been lying lacerated by civil or communal strife. Meaningful agreements were made to put an end to the agitations in the three states and an accord was all but signed in the insurgency-plagued Union Territory. These breakthroughs would not have been possible but for the sense of realism and objectivity of approach of the Prime Minister.

Gujarat Agitation. The Gujarat agitation which lasted five months began as a student protest against reservation system, grew into a violent conflict between upper castes and lower castes among the Hindus and in its last stages, assumed the dimensions of communal strife involving the Hindus, and the Muslims. The agitation was called off on July 19, 1985, following an agreement, but it had cost 215 lives, brought down a ministry and paralysed educational and economic activities for months together.

The agitation which began in February 1985 was, in fact, a sequel to the anti-reservation agitation of 1981 which lasted 102 days and claimed 42 lives. While the first agitation was sparked off by the denial of postgraduate medical admission to a brilliant disabled student, the second was caused by

the Madhavsingh Solanki government's decision to raise the quota of reservation for socially and educationally backward classes (SEBC) in educational admissions and government employment from 10 to 28 per cent. With this the total reservation quota was to be 49 per cent.

The increase, announced in January 1985, was criticised as politically motivated since the state was to have assembly elections in the following March, which the Congress(I) led by Solanki eventually won. The anti-reservation agitation, launched by a section of students before the elections, was slow in taking off but it caught on once the elections were over. The government was forced to announce unilaterally that the increase in the reserved quotas would be applicable only from 1986.

Issue of Quotas. The quotas had been raised on the recommendations of the Rane Commission which had submitted its report in 1983. The government had kept the report a secret and made it public only after the agitators sought the help of the High Court. It was then found that the Rane Commission had rejected the criteria, set up by the Baxi Commission in 1975, for determining backwardness. The Baxi Commission itself had identified 82 SEBCs who were given the benefit of reservation.

The agitation was intensified with various government employees' organisations joining the strike and with the observance of a state bandh. There was widespread violence in Ahmedabad as those supporting the government's reservation policy had also been organising themselves. The anti-reservation agitation by this time had been transformed into a movement against the Solanki government and the situation became explosive with the revolt of policemen on April 22. The police went on a rampage after one of their colleagues was killed by a mob. The Gujarat Samachar press was burnt down and there was communal rioting in the walled city. The situation was brought under control by the army which had been called in Ahmedabad on March 19.

The agitation and the accompanying violence continued unabated until the resignation of Solanki from chief ministership on July 5. Within a fortnight of the installation of Amarsinh Choudhury as the chief minister, the new government signed an agreement with the agitation leaders on July 19. The thrust of the treaty was that the prevailing 10 per cent reservation for the SEBCs would be reviewed by a panel of a sitting High Court Judge and two retired judges. The government agreed that the enhanced reservation quota will not be implemented till a national consensus was reached on the reservation policy.

Peace in Punjab. Punjab, the most prosperous of Indian states, had become a boiling cauldron of unrest because of political manipulations, though there were religious reasons as well. In fact the central character of the Punjab tragedy, Sant Jarnail Singh Bhindranwale, was brought into prominence for use as a weapon against the Akali Dal ministry of Prakash Singh Badal. To launch Bhindranwale, a political party named Dal Khalsa was set up with anti-Nirankari fundamentalism as its strong point. Indeed, extremists started dominating the Akali Dal after the Akali-Nirankari clash on April 13, 1978. That was perhaps the beginning of the Punjab agitation.

The Akali leadership could do little to restrain Bhindranwale from upstaging them. He was beating them in their own game of religious inflexibility and anti-centre gestures. Meanwhile the Akali Dal split into two

parties, one led by Sant Longowal and the other by Jagdev Singh Talwandi. It was the Talwandi group which first raised the demand of autonomy for Punjab to "safeguard Sikh interests."

By the time the Congress(I) returned to power in the state with Darbara Singh as the chief minister in 1980, Bhindranwale had become a phenomenon round whom had gathered people with disparate convictions like Sikh fundamentalists who wanted the creation of a state called Khalistan and Naxalites who wanted to use the rising resentment in Punjab for a class struggle. There were even criminals in the group. Cold blooded killings in broad daylight had become the order of the day.

One person who stood up to the challenge posed by Bhindranwale was Darbara Singh who showed no fear in criticising him openly and even tried to arrest him in connection with the murder of the Nirankari chief. But rivals of Darbara Singh in the Congress(I) foiled the arrest and when finally the Centre made a farce of arresting Bhindranwale, the Sant became a living legend.

Bloody Days. The number of killings was going up day by day. The number of Akali demands too was increasing. Some of the demands like transfer of Chandigarh to Punjab were quite genuine.

Some others like the naming of the Flying Mail as Golden Temple Express were innocuous. Some demands like the one for autonomy raised in the Anandpur Sahib resolution were fraught with dangers. The resolution wanted the Central government to restrict itself to foreign policy and defence. This was preposterous.

In fact, the agitators themselves were not sure of what they wanted. This was because of their disparate outlooks but by the time the President's rule was imposed on the state, it was more or less clear that Bhindranwale was aiming at nothing short of secession of Punjab from the Indian Union.

With this in mind, his followers effectively blocked, through terrorist activities, the Centre's attempts to come to an agreement with the moderate faction of Akali Dal president Longowal. Whenever there was a hope of an agreement, there was a spurt in terrorist activity, with widespread killings, sabotage and even hijacking of planes. Bhindranwale

was now operating from the Golden Temple complex which he had turned into a veritable arsenal. The communal strife between the Sikhs and the Hindus, the underdogs in the state, had become intense.

Meanwhile the extremist killings had assumed an alarming pattern as distinct from the hitherto random killings. The killings were now highly organised and selective, the extremists having prepared hit-lists of prominent politicians and personalities. The state police had proved totally ineffective, and there were indications that the police had become partisan. The army was called in but still there was no respite in extremist activity.

Operation Blue Star. As the extremists were poised to make a mass killing in June 1984, Prime Minister Indira Gandhi decided to send the army to flush them out from the Golden Temple. The army surrounded the temple complex on June 5 and after a pitched battle with the extremists inside, occupied it on June 6. Hundreds of people, including Bhindranwale and his lieutenants Amrik Singh and Shahbeg Singh, were killed and the Akal Takht suffered heavy damages in the army action. The army too suffered heavy casualties. One unfortunate fall-out of the army action was a revolt by a few sections of Sikh soldiers in several parts of the country.

The army action in the Golden Temple, though it was the need of the hour, inflicted a grievous wound in the Sikh psyche. The nation paid dearly for it when Prime Minister Indira Gandhi was assassinated by two of her Sikh bodyguards on October 31, 1984. There followed communal riots in various places, especially Delhi where hundreds of Sikhs were massacred.

The process of reconciliation in Punjab began with the new Prime Minister constituting a high level committee to look into the entire gamut of the Punjab problem on January 3, 1985. Two months later Longowal, who had been arrested from the Golden Temple by the army, was released and Arjun Singh, chief minister of Madhya Pradesh, was appointed Punjab Governor. A month later on April 11 the Centre lifted the ban on the All India Sikh Students Federation and agreed to hold an inquiry into the post-assassination riots in Delhi. The stage was

thus set for peace talks.

Historic Pact. Though the extremist groups were still at large and certain factions in the Akali Dal were trying to sabotage the peace offensive by Longowal, the Sant consolidated his position gradually and, a full year after the army action in the Golden Temple, was brought around by Arjun Singh for peace talks. Longowal met Rajiv Gandhi for the first time on July 23, 1985. The historic Punjab accord was signed by them the next day. The quickness with which Rajiv Gandhi achieved it surprised the whole nation. The era of confrontation was near its end.

Under the 11-point accord, the Union Territory of Chandigarh was to be transferred to Punjab with effect from January 26, 1986 and Haryana was compensated for its loss of capital by transferring to it some Hindi-speaking areas of Punjab. A commission was set up to demarcate these areas. Another commission was to examine the remaining territorial claims of the two states.

The future of Abohar and Fazilka, which under Mrs Gandhi's award had been included in Haryana, were also to be settled by this commission. The claims of Punjab, Haryana and Rajasthan on sharing the Ravi-Beas waters were referred to a tribunal headed by a Supreme Court judge for adjudication within six months.

Issues Referred. The controversial aspects of the Anandpur Sahib resolution dealing with Centre-state relations were referred to the Sarkaria Commission. Akali Dal had agreed that the resolution falls within the framework of the Constitution and that its demand for greater autonomy for the state does not undermine the unity and integrity of the nation.

The government committed itself to consider formulation of an all-India Sikh Gurudwara Bill. The commission inquiring into the Delhi riots was asked to extend the inquiry to the disturbances in Bokaro and Kanpur and the government agreed to pay compensation for property damaged, along with ex-gratia payment to victims of the agitation or any action after August 1, 1982.

In order to dispel misgivings that the Sikhs were being discriminated against in recruitment to the armed forces, the accord stressed that all citizens of the country had the

right to enroll in the army and merit was the only criterion.

The accord was not without its critics and Sant Longowal became a martyr for peace when he was assassinated on August 20. But the accord was ratified by the people of Punjab when they chose his party in the elections held on September 25, 1985. The elections were the final step in the process of normalisation in Punjab. Surjit Singh Barnala, the trusted lieutenant of the assassinated Sant, became the new chief minister and Akali Dal president.

The Assam accord. The spark of the six-year Assam agitation came from an observation the then chief election commissioner S.L. Shakhder made at a conference of chief electoral officers at Ooty in Tamil Nadu on September 24, 1978. Expressing his grave concern over inclusion of foreign nationals in the electoral rolls, Shakhder said that in one case the "population in the 1971 census recorded an increase as high as 34.98 per cent over the 1961 figures and this increase was attributed to the influx of a very large number of persons from the neighbouring countries. "As the influx was continuing, he said, a stage would be reached when that state may have to reckon with the foreign nationals who may constitute a sizeable percentage, if not the majority, of the population." He was referring to Assam.

The statement evoked a ready response from the Assamese people who had been aware of the problem better than anybody else. Well before Shakhder made the observation, the Assam Sahitya Sabha had presented a memorandum to the Centre, requesting it to delete from electoral rolls the names of East Pakistanis who had entered India after March 25, 1971, the day when India stopped registration of East Pakistanis as Indian citizens. The Sabha also wanted those East Pakistanis who entered the state between 1948 and March 25, 1971 to produce the registration certificates.

When Assam came under the British in 1826 its population was 10 lakh, which swelled to 200 lakh by 1981. Not only were the Assamese reduced to a minority in their homeland but outsiders, especially Bengalis, had come to dominate every field.

Boycott. Such was the situation when Shakhder hinted that foreign nationals may

capture political power in Assam and it spurred the Assamese into action. The initiative was taken by the All Assam Students Union (AASU) when it announced, towards the end of 1979, boycott of the seventh Lok Sabha elections which were to be conducted on the basis of the 1971 electoral rolls which contained the names of lakhs of people without Indian citizenship.

The AASU's boycott call was supported by the Assam Sahitya Sabha, the Assam Jatiyabadi Dal and the Purabanchaliya Lok Parishad. These three organisations, along with a few others, later formed the All Assam Gana Sangram Parishad (AAGSP).

The poll boycott was a total success in the Brahmaputra Valley with no candidate to contest the elections. However, elections were held in other parts of the state where Assamese do not form the majority. Though the agitators had announced a peaceful programme of action, which included blockade of petroleum goods and forest produce movement out of the state, the struggle inevitably became violent. Also the agitation had a communal overtone as most of the illegal immigrants were Bengali Muslims.

25—Round Talks. There were about 25 rounds of talks between the agitators and the Union government over the six years of agitation. The first round was in February 1980 soon after the return of Mrs Gandhi to power. The agitators' demand was that all the illegal immigrants who came to Assam after 1951 should be expelled. This was unrealistic as it would have meant expulsion of 25 to 55 lakh people whom the agitators claimed were foreign nationals. The Centre suggested that those who came after 1971 could be expelled.

After nine rounds of discussions the AASU and the AAGSP were ready to have 1961 as the cut-off year for identifying foreigners in Assam and they insisted on expelling all those who came after 1971. Now the areas of dispute were dispersal of those who came between 1961 and 1971 and the documents to be examined by the tribunals for identifying illegal immigrants. The talks remained deadlocked.

In between the talks agitators organised a number of bandhs, blocked road and rail movement and conducted picketing of government offices. There were widespread

violence, sabotage, police firings and the army had to be called in several times.

The worst carnage committed during the agitation came along with the assembly election of February 1983. Hordes from Bangladesh crossed over to Assam villages and massacred hundreds of people. This was followed by the massacre in Nellie on February 20 in which about a thousand people, mostly women and children, were killed. Besides, nearly a hundred people had been killed in election violence. The agitators had boycotted the election and it was a pyrrhic victory for the Congress(I), and the new chief minister Hiteswar Saikia.

The agitators never accepted the legitimacy of the Saikia government and refused to deal with it throughout, although peace talks with the Centre were resumed in March 1984 on an informal level. The last round of talks the agitators had with the government of Mrs. Gandhi was in September 1984, which too was infructuous. By the time one of the main demands was removal of the Saikia ministry.

Attitude Softened: The agitation leaders had softened their stand and lost considerable mass support to their long drawn agitation by the time Rajiv Gandhi became the Prime Minister. They had four rounds of discussions since January 1985 with the Centre and the breakthrough was achieved during a series of discussions between May 6 and June 4. The accord, however, was signed only on the Independence day.

According to the agreement, signed by the agitation leaders and the Union Home Secretary at the residence of the Prime Minister, foreign nationals who entered Assam between January 1st, 1966 and March 25, 1971 were to be disfranchised for a period of ten years. All those who entered Assam after March 25, 1971 were to be expelled. Along with concessions of development plans and withdrawal of repressive laws that were in existence in Assam, it was stated mutely that the Saikia ministry will resign and fresh elections will be ordered. That signalled the end of the Assam agitation that began with a bandh call on June 8, 1979 and cost more than 7,000 human lives and hundreds of crores of rupees.

The Assam assembly was dissolved on August 18 with Saikia continuing as caretaker

chief minister. In the elections held on December 16 one of the main contesting parties was the Assam Gana Parishad formed by the leaders of the Assam Agitation.

Hope in Mizoram: Though no formal agreement has been signed to end the two decades of insurgency problem in the Union Territory of Mizoram, the stage was all set for the outlawed Mizo National Front led by Laldenga to bid a farewell to arms. There has been an understanding between Laldenga and the Centre for elevation of Mizoram to statehood and installation of Laldenga as the caretaker chief minister after removing the present Congress(I) ministry and ordering fresh elections.

Mizoram was part of Assam until 1972. The Assam government had more or less neglected the Mizos who lived around the Lushai Hills, and the discontent among the Mizos, who had a high literacy rate, was aggravated by the famine of 1959. The flash-point came in 1966 when the Mizo National Front and its Mizo National Army rose up in arms to demand nationhood for the Mizos.

The revolt was crushed by the Indian armed forces and draconian laws were imposed on the Mizos, which alienated them further from the national mainstream. And even though Mizoram was separated from Assam and made a Union Territory in 1972, little was done to assuage the hurt feelings of the Mizos and Mizoram was brought under the Disturbed Areas Act on September 8, 1974. The Mizo rebels who wanted an independent nation for themselves were believed to be backed by the Chinese.

Return of Laldenga: In 1976 when Laldenga returned from voluntary exile in West Germany there were high hopes of a settlement with the Centre agreeing to elevate Mizoram to statehood. But the Centre could not give in to the rebel leader's demand to dismiss the People's Conference ministry of Brig. T. Sailo and install Laldenga as chief minister until fresh elections. Besides, Laldenga wanted a special status for Mizoram, in fact more than what had been given to Kashmir.

It became clear to the Centre that the MNF wanted to reserve all jobs in Mizoram for Mizos and that it would not allow non-Mizos to buy land or do business in the state

that the rebels envisioned. The rebels also wanted to abolish the Autonomous District Councils intended to protect the tribal minorities.

The situation has now changed for the better with both sides taking a realistic approach. According to the agreement worked out between Laldenga and the government of Rajiv Gandhi, the Centre would grant amnesty to all members of the MNF, who will surrender their arms. Mizor-

am would be granted statehood but Constitution has to be amended for the purpose.

Elections are expected after the formation of the state, with the present Congress(I) chief minister Lalthanhawla stepping down to let Laldenga become the caretaker chief minister. It must be mentioned that Lalthanhawla, who was himself an MNF activist in the early years of his political career, has been working for the reconciliation with the Mizo rebels.

103. NATIONAL ECONOMY

The growth of population overriding the growth of national income has been the bane of Indian economy. India's national income rose from Rs. 167.31 billion in 1950-51 to Rs. 540.00 billion in 1983-84 (at 1970-71 prices) indicating a three-fold increase in 33 years.

During the same period the population also grew from 369 million to 724 million. This sharp increase has virtually eroded the growth in income. Per capita income rose by 53 per cent recording an annual rate of rise of 1.3 per cent only. Many other developing countries witnessed a much higher rate of growth.

The object of planning in our country was to give a social and economic content to political freedom. After completing six Five-Year Plans, the country does not appear to be nearing this goal. And the same goal is now laid down in the Seventh Plan.

Agriculture: Indian five-year plans have accorded the highest priority to agriculture. As a result of planned efforts, India's foodgrains production has risen from 55 million tonnes in 1950-51 to more than 150 million tonnes in 1983-84. This is certainly praiseworthy. It has rid the country from famines which used to visit at regular intervals. Currently we have large buffer foodgrains stocks with the Food Corporation of India, besides the stocks with traders all over the country. At a moment's notice, foodgrains can now be sent by rail to any deficient area.

The healthy development on the food front has not been matched by progress in certain other areas. The country remains deficient in the supply of edible oils, pulses and cotton. These crops have not kept pace with demand in the country. Hence they have

become major items on India's import list. For example, the cost of importing edible oils has now reached Rs. 10 billion.

Even though agriculture is a state subject, the Centre has continued to play the role of a catalyst. It has taken measures to increase the supply of such inputs as high yielding

National, Per Capita Incomes

India's national income (net national product at factor cost) during 1982-83 at current prices was Rs.1,34,066 crores. At 1970-71 prices this was Rs.50,486 crores.

Gross National Product at factor cost at current prices was Rs.1,45,141 crores and at 1970-71 prices Rs.54,194 crores.

The all India annual average per capita income during 1980-84 was Rs.1844. The union territory of Pondicherry registered the highest per capita income at Rs.3546, at current prices, which is 92% above the all-India average.

Punjab's annual per capita income was the second highest at Rs.3308, 70% above the all India average.

The lowest was that of Bihar - Rs.1033 which is a little above half the national average.

Is There a Real Growth?

"Claims that there has been an accelerating rate of growth, that poverty has been on the decline and that the majority of the poor is getting better off, have no basis"-this is the conclusion of two specialists in the study of economic growth and poverty, Suresh Tendulkar and K. Sundaram of the Delhi School of Economics. They have made the following observations.

The inter-related claims regarding the growth rate along with its trickle down and the incidence of poverty have surfaced in recent months.

Claim 1: *The Indian economy has been experiencing a significant step-up from its historical Hindu growth rate of 3.5 per cent per annum to somewhere near 5 per cent per annum in a sustained fashion especially over the decade from 1973-74 to 1983-84.*

Claim 2: *The incidence of poverty has been declining in the seventies and that the 'poor are getting richer'. This, in turn, is being adduced as evidence of the successful trickle-down of the growth process as asserted in Claim 1.*

Barring the oil crisis of 1973-74 (which could not have brought about an upward shift in growth rate) and a sudden spurt in export earnings (which remained basically marginal in relation to the domestic market), one cannot think of any significant change which would mark off the period 1973-74 to 1983-84 from the one prior to it.

The incidence of rural poverty is inversely related to the real agricultural income per head of the rural population. This means that the incidence of poverty tends to go down in the year of bumper harvest and go up in the year of drought.

On an average, 3.62 million persons were being added to the population of the rural poor over the period 1956-57 to 1977-78. Over a somewhat shorter period 1960-61 to 1977-78, the trend additions to the population of the urban poor amounted to 1.45 million.

If we take into account the poor households

crossing the poverty line and the non-poor households getting below the poverty line the net annual increases of population located in the poor households turned out to be 3.62 million (rural) and 1.45 million (urban) on an average over the stated periods.

The so-called additional evidence in support of the proposition that the poor are getting richer is neither complete nor conclusive. It can at best endorse a statement that some poor may be getting richer.

What do we conclude from these?

First, *there has been no significant step-up in the rate of economic growth. It has remained around 3.5 per cent - Prof. Raj Krishna's Hindu growth rate. The marginal acceleration during 1973-74 and 1983-84 is dominated by the tertiary sector - a puzzling phenomenon.*

Secondly, *the acceleration thesis cannot be sustained by resorting to the existence of a plausible growth in the unaccounted economy.*

Thirdly, *the percentage of the population below the poverty line has fluctuated without any trend towards increase or decrease both for the rural and urban population. The absolute population of the poor has, however, been rising at an annual average rate of 3.5 million (rural) and 1.45 million (urban).*

Fourthly, *there are serious problems of non-representativeness and lack of reliability with the new survey results of NCAER. * They can at best lead to the conclusion that some poor may be getting richer but it is not possible to make the statement with reference to the majority of the poor.*

Finally, *the additional pieces of evidence in support of the proposition that the poor are getting richer are neither complete nor conclusive.*

The overall conclusion should be obvious that the claims that there has been acceleration in the growth rate, that poverty has been on the decline and that the majority of the poor is getting better off, have no basis.

* NCAER. National Council for Applied Economics & Research

varieties of seeds, fertilisers, pesticides, tractors, etc. To check soil erosion, land degradation and wastage of water and to make scientific use of land and water resources, a number of programmes have been completed both in the central and state sectors.

Afforestation. In recent years, the government has come to realise the importance of afforestation. The government passed the Forest (Conservation) Act, 1980, which provided that no forest land in the country would be diverted for non-forestry uses unless it was absolutely essential.

Two more steps taken by the government have gone a long way in giving a push to agriculture. First, efforts have been made to bring increased areas under irrigation, and in this regard unprecedented gains have been recorded during the Sixth Five-Year Plan period. Second, agricultural price policy has been extremely helpful in providing remunerative prices to farmers. The Agricultural Prices Commission which recommends procurement (or minimum) support prices for various commodities, takes into account the changes in terms of trade between agricultural and non-agricultural sectors.

Agriculture has to face floods, drought, cyclones and hailstorms. During the past 38 years, the government has learnt the technique to provide relief to the afflicted population. Substantial funds are set apart every year in order to face these calamities.

Industry. The industrial growth of this country has been encouraging ever since independence in 1947. This is clear from a comparison of output in major industries in 1948-49 and 1982-83. For instance, sugar production in 1948-49 was around a million tonnes which rose to more than eight million tonnes in 1982-83.

The other industries which showed phenomenal growth are cement, steel, crude oil, petroleum refinery products, nitrogenous fertilisers, engineering products, chemicals, pharmaceuticals etc. Consequently the share of industry (manufacturing, construction, power, etc.) in its contribution to national income rose from 20.3 per cent in 1950-51 to 23.0 per cent in 1982-83.

It is now recognised that the Indian economy has built up a substantial and diversi-

fied modern industrial sector. What is more the economy has acquired the capability to satisfy a large proportion of its requirements of various industrial goods from domestic industrial units.

The performance of the public sector taken together has not been according to expectations even though certain individual units have a good track record. This was due to the fact that in official circles, there was no clarity of thought and purpose in so far as the objective of setting up the public sector units was concerned.

The public sector enthusiasts shouted from housetops that these units had not been set up with the objective of profiteering. But they also forgot that units which did not throw up adequate surpluses tended to thwart their own progress.

Technical Know-how. The technical know-how has taken rapid strides since 1947. Our country has sought collaborations with foreign firms in order to adopt the latest techniques in manufacture. There have been periods when the conditions for collaboration have been stringent but in recent years, they have been made rather liberal though the foreign collaborators continue to complain about the red tape and bureaucratic delay.

Foreign capital has also been encouraged but under Foreign Exchange Regulation Act (FERA), it has been stipulated that the foreign companies would have a dominant share in rare cases only. That is why IBM and Coca Cola packed up, they did not want to dilute their capital. Even pharmaceutical companies have fallen in line. Only 10 companies, at the time of writing, are resisting dilution of capital.

The country has entered even sophisticated industries in a big way. Electronics, space and atomic energy are all under the charge of the Prime Minister. Electronics in particular has made very fast progress. TV has reached the country far and wide. Computers, telecommunication equipment, radars, instruments, etc., are being manufactured in a big way in this country.

In recent years, the accent on research and development has been increased in order to bridge the gap between technical know-how in this country and the industrialised countries. *As an industrial country,*

India's rank is tenth in the world, which is a no mean achievement.

A study of the national income data for the past 38 years shows that the share of agriculture has been declining while that of industry and "transport, communication and trade" has been increasing. At current prices, the share of agriculture in 1948-49 was more than 50 per cent which stood reduced to 38.5 per cent in 1981-82. Industry stood at 22.5 per cent and "transport, communication and trade" at 22.6 per cent. In other words, both the secondary and tertiary sectors have been gaining at the expense of the primary sector.

But all is not well with the Indian economy. There are certain trouble spots which have not been tackled successfully. For instance, the number of the unemployed has continued to increase plan after plan. At the end of each Five-Year Plan, the number of the unemployed was more than at the beginning.

There are no official estimates of the unemployed or the under-employed. Unofficial estimates put the figure at more than 40 million. The number of those registered with the employment exchanges is more than 22 million.

Poverty line. Then, there is the problem of poverty which is closely linked with that of unemployment. Nearly half of the population of the country lives below the poverty line, implying that even the minimum needs of food are not available to them. This is certainly the result of the galloping rise in population.

The picture on the foreign trade front is gloomy. The trade gap has remained wide for three consecutive years. The problem has been tackled by seeking aid from friendly nations. The remittances sent by Indians working abroad has also come in handy.

104. NEW ECONOMIC POLICY

Liberalisation of economic policy was the highlight of the first budget of Rajiv Government in March '85. The compulsion of raising resources for a large Seventh Plan (Rs. 1,80,000 crores) did not prevent it from simplification and rationalisation of the tax structure.

A tougher stance against blackmoney together with changes such as broad banding in industrial licensing policy also reflected in the Union budget for 1985-86 presented to Parliament by Finance Minister, Viswanath Pratap Singh.

Reliefs. The budget offered tax reliefs to individuals and the corporate sector and the resultant budgetary gap was sought to be partially offset by levies, the effect of which was that items like petroleum products, cement and steel will cost more.

Total receipt in 1985-86 were estimated at Rs. 47,635 crores. The gross tax revenue at existing levels of taxation was estimated at Rs. 25,514 crore, compared to Rs. 23,702 crore in the current year.

The state's share of taxes was estimated at Rs. 6,592 crore against Rs. 5,777 crore in 1984-85 representing an increase of Rs. 815 crore. Out of this increase, Rs. 487 crores was due to stepping up of states' share of basic

excise duties from 40 per cent to 45 per cent from next year as recommended by the Eighth Finance Commission.

Receipts from the market loans were placed at Rs. 5,100 crore against Rs. 4,100 crore in the current year. Small savings collections were estimated at Rs. 3,900 crore against Rs. 3,300 crore in 1984-85.

Total expenditure was placed at Rs. 51,295 crore, leaving a budgetary gap of Rs. 3,660 crore, at the existing rates of taxation.

New Proposals. Several measures to rationalise the tax structure, raising the income-tax exemption limit to Rs. 18,000, abolition of surcharge on the income tax payable by non-corporate tax payers, cut in the maximum marginal rate of income-tax to 50 per cent, abolition of the Compulsory Deposit Scheme, reduction in the Corporation tax by 5 percentage points, increase in the customs duty on crude petroleum, increase in the basic excise on cement and on printing

How A Rupee Comes And Goes

Of every rupee that accrues to the Central exchequer in 1985-86, customs will contribute 16 paise, excise 14 paise, corporation tax 6 paise and income tax and other taxes 1 paise each. Market loans, small savings, provident funds and deposits of non-Government provident funds, LIC, GIC, etc will contribute 22 paise, non-tax revenue 15 paise, loan recoveries 8 paise, other receipts 7 paise, external loans 4 paise. Six paise has been left as deficit.

Of every rupee that is to collect, 57 paise will be spent on development. Of this, 36 paise will go for Plan expenditure and 21 paise for other development expenditure.

Of the remaining 43 paise, interest payments will absorb 14 paise, other expenditure 9 paise, statutory and other transfers to State and Union Territory Governments 5 paise and defence 15 paise.

and writing paper, abolition of licences for radio and TV sets highlighted the budget.

The taxation measures proposed in the budget were estimated to yield a net additional revenue of Rs. 311 crore to the centre and Rs. 132 crore to the states. There was an uncovered deficit of Rs. 3,349 crore.

In the field of direct taxes, other features of the budget included abolition of estate duty, raising of wealth tax exemption limit to Rs. 2,50,000 and reduction in the maximum marginal rate of wealth tax to 2 per cent, discontinuation of interest-tax, incentives for exporters and tea-growers and discontinuance of the advertisement expenditure disallowance.

Petroleum. In the sphere of customs duty, the main feature of the budget was an increase in auxiliary duty on crude petroleum to Rs. 300 per tonne and levy of a basic customs duty of 10 per cent ad valorem on crude petroleum. Export duties on 12 items were abolished. Advanced type of computers were exempted from customs duty.

The budget provided for raising the basic excise on cement to Rs. 225 per metric tonne increase in the duty on printing and writing paper and kraft paper by Rs. 200 per tonne, stepping up of the excise on vegetable product to 10 per cent, and exemption of 100 items from special excise duty. The basic excise duty on aerated waters and soda water was raised by 5 paise on a bottle of 200 milli-litres.

Bidis and 'Pan Masala' would cost more. The basic excise duty on commercial vehicles and three-axled vehicles went up; but there were concessions for the turbo-charged commercial vehicles and passenger cars. The small-scale sector also received concession in excise duty. Computers, black and white TV sets with a screen size of upto 36 cm and shoddy woollen blankets were completely exempt from excise duty.

The licence for radio and television sets was dispensed with. Its place would be taken by an excise duty on customs levy to be paid at the point of manufacture/import. Sportsmen winning awards of international significance also got concessions.

Federal Structure. The Indian financial system has gradually evolved on federal lines. Before 1871, the Central Government had complete control over provincial revenues and expenditure. All the revenues were credited to the Central Government and the Central Government made fixed grants to the provinces to meet their expenses.

Under the Government of India Act 1919, a complete separation between Central and Provincial heads of revenue was made. Income tax and Central stamps were assigned to the Centre and Excise, Judicial stamps, Land Revenue and Irrigation were made over to the Provinces.

Under the Government of India Act 1935, income tax (excepting Agricultural Income tax) was to be collected by the Centre and a percentage of the net proceeds was to be distributed among the provinces.

Source of Revenue. The main source of Union Revenue is customs and excise duties levied by the Union Government, corporation tax and income tax, wealth tax and profits transferred from the Reserve Bank and Railways and contributions made

by the Posts and Telegraphs.

The main sources of revenue for the states are land revenue, sales tax, agricultural income tax, state excise duties, registration and stamp duties. The share of Union taxes and duties and grants-in-aid received from the Union constitute a substantial item in State finance.

The devolution of resources from the Union to the States is perhaps the most important feature of public finance in India.

The States receive not only their share of Union taxes and duties, statutory grants and grants-in-aid, but also loans for various development schemes and for rehabilitation purposes.

Non-tax revenues accrue from interest receipts, currency and mint, irrigation, electricity, public works, administrative services, and social and developmental services. The share of the non-tax revenue in the total revenues of the Union government has progressively increased from 1950-51.

Direct taxes include taxes on income and expenditure and those on property and capital transactions. Indirect taxes cover taxes on commodity and excise levies and customs duties.

The share of indirect taxes in the total tax revenue of the Union Government has been steadily on the increase since 1950-51.

The Budget. Under Art. 112 of the Constitution a statement of estimated receipts and expenditure of the Government of India has to be laid before the Parliament for every financial year—1st April to 31st March. This annual financial statement is known as Budget. The budget shows receipts and payments of the Government under three heads. (1) Consolidated Fund (2) Contingency Fund, (3) Public Account.

Consolidated Fund includes all revenues and loans received by the Government. All expenditure from this account has to be sanctioned by Parliament.

Contingency Fund is a sum placed at the disposal of the President to meet unforeseen expenditure. Amounts spent from this Fund can be re-imbursed from the Consolidated Fund with the sanction of the Parliament.

Public Accounts represents all receipts and payments which are in the nature of a deposit account with the Government like Provident Funds. Small Savings collections

Zero-based Budget

It is proposed to commence zero-based budgeting in the Central government from 1986-87 to be effective from the 1987-88 budget, the Minister of State for Finance, Mr. Janardhan Poojari, informed the Rajya Sabha on Dec. 3, 1985.

The need for the Central government departments to adopt zero-based budgeting has been recognised in principle.

This requires identification and sharpening of objectives, examination of various alternatives of performing identified tasks, cost-benefit analyses, prioritisation of objectives and activities, identification and elimination of redundant activities and designing and ranking decision packages.

Zero-based budgeting devised by American corporate world in 1960's will do away with the traditional incremental approach. Instead every item of expenditure a programme will have to justify its viability in cost-benefit terms so as to get a budgetary provision in its favour in the next budget.

Though this form of financial planning is adopted ostensibly for ensuring that every rupee is spent on result-oriented activity, critics say that non-viable but popular programmes may be jettisoned in the long run.

etc. No parliamentary sanction is necessary for their disbursement.

Charged Accounts. Under the Constitution certain payments like the emoluments to the President or Supreme Court Judges are on the Consolidated Account. Expenses on this account do not require parliamentary sanction as such, but are nevertheless shown separately in the budget.

Appropriation Act. The estimates of expenditure are placed before the Lok Sabha in the form of a Demand for Grants. Ordinarily a separate demand is made for each ministry. The Appropriation Act authorises

withdrawal of the estimated expenditure from the Consolidated Fund.

Finance Act embodies the tax proposals of the budget which are passed by Parliament each year.

Though the budget is prosaically described as the Annual Financial Statement, it is something more than that in the context of the Indian economy. It is the primary instrument by which plan policies are implemented. Since the plan encompasses all aspects of the national economy, the budget becomes the regulatory mechanism, which controls money supply, credit, prices, public debts, industry, imports and exports, agricultural output, savings, investments and the national income as a whole.

Revenue and Capital Budget. Under the Constitution, Budget has to distinguish expenditure on revenue account from other expenditure. A budget, therefore, comprises (i) Revenue Budget and (ii) Capital Budget.

Revenue Budget consists of the revenue receipts of Government (tax revenues and other revenues) and the expenditure met from these revenues. Broadly speaking, expenditure which does not result in creation of assets is treated as revenue expenditure. All grants given to State Governments and other parties are also treated as revenue expenditure.

Capital Budget consists of capital receipts and payments. The main items of capital receipts are loans raised by Government from the public which are called **Market Loans** borrowings by government from Reserve Bank and other parties through sale of

Income Tax

Income Rs.	Tax as per rate	Tax as per new rate
16000	225	Nil
17000	450	Nil
18000	675	Nil
19000	900	250
20000	1125	500
21000	1406	750
22000	1688	1000
23000	1969	1250
24000	2250	1500
25000	2531	1750
30000	4219	3250
40000	8156	6250
50000	12656	13250
70000	22781	17250
80000	28406	21250
90000	34031	25250
100000	39656	29250

Treasury Bills (which are repayable after 91 days, but renewable), loans received from foreign Governments and bodies and recoveries of loans granted by Central Government to State Governments and other parties.

Capital payments consist of capital expenditure on acquisition of assets like land, buildings, machinery, equipment, as also investments in shares etc. and loans and advances granted by Central Government to State Governments, Government companies, corporations and other parties. Capital Budget also incorporates transactions in the Public account.

New Fiscal Policy

Stable Income Tax and Wealth Tax rates, reliefs to the corporate sector and structural reforms in excise and customs duties were the highlights of the long-term fiscal policy announced by Union Finance Minister V.P. Singh on December 19, 1985.

Termed as virtual budget proposals without revenue and expenditure the policy was wholeheartedly welcomed by the business class while it was branded *elitist* by critics.

The following is the summary of the long-term fiscal policy:

• **Interest payments.** It is proposed that in the

next three years the Centre's lending rates will be progressively raised to levels which are adequate to cover the cost of raising the funds.

• **Subsidies.** food and fertiliser subsidies serve important social and economic purposes. In the Seventh Plan, subsidies will increase to 1.1 per cent of GDP from the level

The Cheer and the Tear

The day of the entrepreneur—was the comment of economic analyst Sudhir Mulji on the new budget proposals. He wrote:

There is no other country in the world of comparable size and importance, where so small a revenue give-away could have heralded as dramatic a change as we have just seen in this budget.

Such a low cost "revolution" has only been made possible because the tax system had been so perversely irrational in the past. It yielded no revenue, caused much anxiety and unnecessary hardship to a large number of people, and inculcated the thoroughly bad habit of evading the law at every opportunity.

The interesting question is not what has been done in this budget but why it took so long for successive governments to reach this simple solution.

●Hijacking the Economy

The winds of change blowing over the Indian economy seem finally to have taken their toll on the fragile edifice of the old policy package introduced amidst great expectations during the early years of planning when the orientation was towards "growth with social justice" and "self-reliance"—commented economist Amiya Kumar Bagchi. He said:

The budget of the Central government has produced predictable jubilation in business quarters. The euphoria has been expressed in suitably ponderous prose by such worthies of the corporate circles as Nani A. Palkhivala and Pesi Narielwala.

Responsible students of the Indian eco-

nomy and society have wondered at the seeming indifference of Indian capitalists to the portents of increasing influence of foreign capital on the domestic economy. They have also wondered at the gamble taken by the top political leaders in displaying their contempt for compassionate gestures for the poor, the hungry, the oppressed, the handicapped, the illiterate in our country.

●In Service of the Rich

It is budget in service of a thin top stratum of affluence in Indian society—commented economist Balraj Mehta. This is what he said:

According to a report in a national daily "the common man seemed happy (on the budget day) on two counts—the relief in income tax and the abolition of the Compulsory Deposit Scheme." In the parlance of the reporter, "the common man" is evidently somebody who has a net income of not less than Rs. 15,000/- a year—someone in his own class whom he can identify.

But how many are there among the 700 million people of India, with per capita income of Rs. 2000/- and income distribution highly skewed, who have income of Rs. 15,000/- or more and are, therefore, happy with the budget for 1985-86, in which taxes on incomes and wealth have been either dramatically removed or heavily reduced? According to the Finance Minister, Mr. V.P. Singh, only 3 million will now pay any income tax after he has so grandly thrown one million out of the income tax net.

of 1 per cent in the Sixth Plan. It is however, essential to contain subsidies within the limits envisaged in the Plan.

●**Tax structure.** There is need for structural reform in the tax system. The process of reform has to be phased over a number of

years and will have to go beyond the Seventh Plan. The policy has outlined a programme of major reform over the next few years.

●**Income tax.** In order to foster stability is intended to keep the present rate schedules for taxes on personal income and wealth

unchanged for a minimum period of five years. The Government will also review the impact of inflation of effective rates of taxation once every two or three years and adjustments will be made in the tax brackets.

• **Simplification of direct tax.** The Government has decided to rewrite direct tax laws with a view to rationalising and simplifying them and bringing about uniformity of procedures for all direct taxes. The draft bill incorporating the necessary amendments is expected to be ready by June, 1986.

• **Incentives for saving.** A new instrument the national deposit scheme (new series), in place of the present national deposit scheme is being considered.

Deposits under the new scheme will be eligible for deduction from taxable income to the extent of 50 per cent of the net deposits made in a year. The net withdrawals of a year will be added to the taxable income of the year to the extent of 50 per cent.

Deposits under the scheme will carry interest at 10 per cent per annum.

• **Corporate tax reform.** The 1985-86 budget had also initiated a process of reform of the corporate tax. At present the depreciation schedule lays down a number of rates and requires maintenance of records of written down value of assets in detail. It is proposed to simplify the rates of depreciation to only 2 or 3.

• **Gift Tax.** Gift Tax will continue to be levied. However, the Government will review the provisions with a view to rationalising them. In particular consideration will be given to enhancement of the exemption level to take into consideration the effect of increases in prices since the present exemption limit was fixed.

• **Capital gains tax.** In order to make the tax on capital gains more effective and promote investments in desired channels, the government will undertake an in-depth review of capital gains taxation. The date for revaluation of assets acquired long ago for purpose of computation of capital gains will be advanced to 1.4.1974.

There will be only two rates for deduction of long-term capital gains viz, 50 per cent for capital gains from real estates and 60 per cent for other assets.

Further, investment in bonds issued by the IDBI and HUDCO will also be made eligible for exemption from capital gains tax under section 54E of the Income-Tax Act.

• **Rules for asset valuation.** Review of the valuation rules is in progress and the Government will announce its decisions.

In order to tackle the problem of gross undervaluation of immovable properties it is proposed to confer a right of pre-emption to the Government to acquire any property undergoing a transfer at a value 15 per cent above the price or consideration stated in the transfer deed.

This provision may be limited initially to metropolitan towns and also for property worth more than Rs 10 lakh. Selection will be based on a system of random sampling.

• **Measures against tax evasion.** In order to effectively tackle the problem of tax evasion. The income tax department will implement a comprehensive strategy, which will include.

— Acceptance, in general, of returns in all cases (except companies and trusts) showing returned income of not more than Rs. 1 lakh (Rs. 25,000 in case of companies).

— A thorough scrutiny of a specified random sample of accepted returns.

— Removal of weaknesses in the law which hinders effective prosecution of tax evaders through incorporation of certain provisions in the direct tax law similar to those which already exist in the Customs Act and the Gold Control Act.

— Effective follow up of search and seizure operations, speedy trial of economic offences, including tax evasion, by special courts and.

— Various measures to improve and modernise administration of direct taxes.

• **Venture fund to promote indigenous technology.** To promote commercial application of indigenously developed technology the Government proposes to establish, on an experimental basis, a venture capital fund with an initial capital of Rs 10 crore.

This fund will provide equity capital for pilot plants attempting commercial application of indigenous technology and adapt previously imported technology to widen domestic applications. The fund will be administered by the IDBI.

The resources for the fund will be obtained by imposing a small "R and D levy" on all payments made for purchase of technology from abroad.

The experimental scheme, details of which will be worked out in consultation with RBI, will be reviewed later.

•**Indirect taxes.** The proposed reforms in the structure of customs and excise duties are designed to promote the primary objectives of economic growth equity, simplicity and increase in revenue-raising capacity.

In addition these reforms are intended to serve as vehicles for progressively moving from discretionary quantitative restrictions and physical controls to non-discretionary fiscal instruments in managing the economy.

•**Central excise.** As a major reform of the excise structure, it is proposed to implement a modified vat (modvat) by greatly expanding the present provisions for set-offs for excise and countervailing duties paid on inputs with a view to coming as close to a generalised system of set-offs for taxation of inputs as is administratively feasible.

This programme will be implemented in a phased manner. Loss of duty on inputs will be recouped through higher taxation of final products, as necessary.

•**Simplification.** It is proposed to merge various excise duties into a single basic rate (except additional excise duties in lieu of sales tax) and retain only the cesses as separate in levies earmarked for specific purposes. The number of cesses will also be reduced to a minimum.

The Government is introducing a revised nomenclature for the Central excise tariff which will be broadly in conformity with the harmonised system of classification being adopted for the customs tariff. As one consequence of this rationalisation, the commodities falling in the residuary item 68 of the excise tariff are being clubbed along with other commodities in appropriate sections.

•**Excise concessions to small scale producers.** An established feature of our excise duty structure is the concession scheme for small-scale producers. Fiscal policy will continue to encourage growth of SSI units through excise concessions.

The Government will reform the present scheme of excise concessions in the light of

the recommendations of the recently submitted report of the technical study group on Central excise tariff.

•**Duty drawback scheme for exports.** It is proposed to drastically simplify the present drawback scheme by operating the scheme on the basis of industry rates. In fixing these rates, the Government will err on the side of generosity in assessing the drawback rates that will apply to each industry.

•**Reducing excise arrears due to litigation.** In order to curb excise arrears due to litigation the Government proposes to establish an appellate tribunal to deal with all matters concerned with payments of customs and excise duties.

•**Restructuring of customs duties.** The basic thrust of customs tariff reform will be to place increasing reliance on tariffs to regulate imports and progressively reduce the role of quantitative restrictions in this regard.

Customs tariffs are proposed to be rationalised on the following lines in a phased manner.

— There will be a two-tier structure of customs duties for raw materials and components. Thus, if the basic duty rates on components is set at X per cent, that on raw materials will be generally a somewhat lower X per cent.

— For certain "universal intermediates", which are used in a large number of industries, the objective will be to move towards a rate of customs duty even lower than Y per cent as part of a package to lower the cost of essential indigenous intermediates to Indian industries.

A high-powered committee has been established in the Finance Ministry for undertaking a review of the present tariff structure along with the related policies, and import policy, for different industries.

•**Anti-smuggling measures.** The Government will continue with an anti-smuggling strategy which combines stronger enforcement with economic measures to curb smuggling.

•**Monitoring the burden of taxation.** In order to evaluate the tax system from the point of view of equity, the National Institute of Public Finance and Policy will be asked to conduct a comprehensive and independent study of the incidence of indirect taxes and subsidies

every 3 years or so, with the first such study to be launched in the current year.

Programme for computerisation has already been launched for both direct and

indirect taxes.

The Government will take necessary steps to set up a modernised statistical assessment system.

105. THE SEVENTH PLAN

The Seventh Five-Year Plan (1985-90) put into momentum last year envisages an aggregate outlay of Rs. 348,148 crore with a public sector outlay of Rs. 1,80,000 crore. The draft plan has become a national document for the planing process in the country till 1990.

The plan envisages a total investment of Rs. 3,22,366 crore. Ninetyfour per cent of the total investment would be financed from domestic fund, with a "tremendous" effort at resource mobilisation.

Public Sector. Of the public sector outlay, the investment component would be Rs. 1,54,218 crore. This investment would be financed to the extent of Rs. 54,422 crore (32 per cent) by own savings, Rs. 84,062 crore (56 per cent) by draft on private savings and about Rs. 18,000 crore by foreign borrowings.

Poverty Line

According to the Seventh Plan document, 36.9% of India's population is living under Poverty Line. The planners propose to bring it down to 25.8% by the end of the plan—the year 1990.

This will mean that 272.7 million of the country's population is living under poverty line now. This is to be brought down to 210.8 million through wide spectrum of developmental efforts during the Seventh Plan.

The poverty line was originally defined as Rs. 65 per capita per month at 1977-78 prices for the rural population and Rs. 75 for the urban population.

It has been redefined as an income of Rs. 3500/- per annum. Those who have an income below Rs. 3500/- are considered below poverty line.

The outlay for the central sector will be Rs. 95,534 crore, states Rs. 80,698 crore and Union territories Rs. 3,768 crore.

The Plan places the deficit financing at Rs. 14,000 crore and net borrowings at Rs. 30,562 crore.

The target of additional resources mobilisation by the Centre is placed at Rs. 22,212 crore. The success of the Plan is crucially dependent on the achievement of the targets of additional resources mobilisation and of public savings.

As postulated in the approach paper, full employment and productivity, along with infrastructure and human resource development have been taken as the guiding principles.

Food Front. Continued self-sufficiency in food and expansion of national system of food security have been given high priority. Special efforts would be made to increase the production of oilseeds, pulses, vegetables and horticulture. Productivity in agriculture would be increased through more effective utilisation of irrigation and other potentials. In industry emphasis is being laid on modernisation and high technology.

In the field of employment, a major objective of the Plan is to ensure that growth of employment opportunities is faster than the growth of labour force.

The employment potential is expected to increase by 40 million standard person years against an addition to the labour force of 39 million during the plan.

A faster rate of growth of industry and a vastly expanded housing programme in the

private sector, for which attempts would be made to provide finance through financial institutional sources—will together generate a greater volume of employment in the non-agricultural sector than in the past.

Agriculture. With a view to achieving a faster rate of growth in agriculture and industry, emphasis is laid on investment in infrastructure.

This is done to see that shortages in power, transport and coal would not arise for the scale of activities envisaged in the Plan, which provided a significant increase in the share of energy to the tune of 32 per cent in the public sector outlays—the largest.

One more major thrust in the Seventh Plan is human resources development.

Public sector outlays for social services show a considerable increase compared to the Sixth Plan. Besides expansion of the existing programmes in education, health, science and technology, new initiatives and innovative measures are contemplated in this area.

The balance of payment protections over the five years (1985-90) estimate exports at Rs. 60,653 crore with imports at Rs. 95,437 crore, giving an adverse trade balance of some Rs. 34,700 crore.

Plan Estimates. The following are estimates of financial resources for the public sector plan for 1985-90.

Item	Amount (Rs. crore at 1984-85 prices)
Balance from current revenues at 1984-85 rates of taxes	(—)5,249
Contribution of public enterprises	35,485
Market borrowings (net)	30,562
Small savings	17,916
State provident funds	7,327
Term loans from financial institutions	4,639
Miscellaneous capital receipt (net)	12,618
Additional resource mobilisation	44,702
Net capital inflow from abroad	18,000
Deficit financing	14,000
Aggregate resources	1,80,000

Public Sector. The following are the public sector outlays in the Seventh Plan.

Sl.	Heads of development	Total (Rs. crore)
1.	Agriculture	10,573.62
2.	Rural development	9,074.22
3.	Special area programmes	3,144.69
4.	Irrigation and flood control	16,978.65
5.	Energy	54,821.21
	(include)	
	Power	34,273.46
	New and renewable sources of energy	519.55
	Petroleum	12,627.67
	Coal	7,400.58
6.	Industry and minerals	22,460.83
	(include)	
	Village and small scale industry	2,752.74
	Large and medium industry	19,708.09
7.	Transport	22,971.02
	(include)	
	Railways	12,334.55
	Roads	5,200.04
	Road transport	1,990.10
	Other transport	3,446.33
8.	Communication, information and broadcasting	6,472.46
	(include)	
	Telecommunications	4,538.74
9.	Science and technology	2,466.00
10.	Social services	29,350.46
	(include)	
	Education culture and sports	6,382.65
	Health including medical	3,392.89
	Family welfare	3,256.26
	Housing and urban development	4,259.50
	Water supply and sanitation	6,522.47
11.	Labour and labour welfare	333.72
	Total	180,000.00

States' Outlay. The following is the distribution of Plan outlays among the various States and Union Territories envisaged in the Seventh Plan for 1985-90.

States	Outlay (in crore)
1 Andhra Pradesh	5,200.00
2 Assam	2,100.00
3 Bihar	5,100.00
4. Gujarat	6,000.00
5. Haryana	2,900.00
6. Himachal Pradesh	1,050.00

7. Jammu and Kashmir	1,400.00
8. Karnataka	3,500.00
9. Kerala	2,100.00
10. Madhya Pradesh	7,000.00
11. Maharashtra	10,500.00
12. Manipur	430.00
13. Meghalaya	440.00
14. Nagaland	400.00
15. Orissa	2,700.00
16. Punjab	3,285.00
17. Rajasthan	3,000.00
18. Sikkim	230.00
19. Tripura	285.00

Union Territories

1. Arunachal Pradesh	400.00
2. Chandigarh	203.00
3. Dadra and Nagar Haveli	46.00
4. Delhi	2,000.00
5. Goa, Daman and Diu	360.00
6. Lakshadweep	43.00
7. Mizoram	260.00
8. Pondicherry	170.00

Planning Commission. Economic planning in India is under the aegis of the Planning Commission. In March, 1950, the Government of India set up a Planning Commission to prepare a plan for 'the most effective and balanced utilisation of the country's resources'. The Planning Commission has since been functioning as the kingpin of national development.

The composition of the Commission as on January 1, 1985 was as follows:

Chairman: Rajiv Gandhi, Prime Minister.
 Dy. Chairman: Dr. Manmohan Singh. Members: V. P. Singh, P. V. Narasimha Rao, Dr. Raja Chelliah, Abid Hussain, Hiten Bhaya, Dr. C. H. Hanumantha Rao, Prof. M. G. K. Menon, Member Secretary: K. V. Ramanathan.

First Plan 1951-56. The first Plan with a total outlay of Rs. 2378 crore was a rather haphazard venture, as the Planning Commission had no reliable statistics to work upon. Besides, the plan had to be co-related to the prevailing activities of various government departments. The result was patchwork of isolated projects. All the same, the plan had a national character and was based on a rational hypothesis. It laid emphasis on agriculture, irrigation, power and transport so as to provide an infrastructure for rapid industrial expansion in future. The plan turned out

to be more than a success, mainly because it was supported by two good harvests in the last two years.

Second Plan 1956-61. The Second Plan (1956-61) was a big leap forward. It laid special stress on heavy industries. The industrial policy resolution was amended so as to shift the primary responsibility for development on the public sector. Private sector was left to handle consumer industries. But the great quantity of imports that the Plan envisaged in both public and private sectors, practically denuded India's accumulated sterling balances (as much as Rs. 500 crores) in two years and compelled the country to seek extensive foreign aid. Agriculture and small-scale industries remained sluggish, without adding any momentum to development.

Third Plan 1961-66. The Third Plan rode on a wave of high expectations following overall growth of the Indian economy in the first two plan periods. The Third Plan aimed at establishing a self-sustaining economy, internal resources having been strained to the utmost, the Plan had to rely on heavy foreign aid.

During the Third Plan, national income (revised series) at 1960-61 prices rose by 20 per cent in the first four years but registered a decline of 5.6 per cent in the last year. Per capita real income in 1965-66 was about the same as it was in 1960-61.

A growing trade deficit and mounting debt obligations led to more and more borrowings from the International Monetary Fund. The rupee was devalued in June, 1966 to little purpose, as it soon turned out. The Third Plan had become stuck.

Interim Planning. The Third Plan having gone awry, planning itself had become discredited in the eyes of many and demands were made from different quarters to declare a Plan holiday. But neither the Government nor the Planning Commission admitted failure. They refused to fall in with the demand for a Plan holiday and proceeded to draw up the Fourth Plan as from 1966-67. But the economy had so far degenerated that the Fourth Plan could not be started in time, that is to say, in 1966. Instead, as a stop-gap arrangement planning was made annual. The Annual Plans continued

The Rise and Fall of Rupee.

The Rupee was first minted in India during the reign of Sher Shah around 1542. It was a silver coin weighing 179 grams of pure silver. The Rupee soon displaced the old gold coins and became the standard currency in India and a currency of repute outside India. The English East India Company adopted the Rupee as their currency in India.

In March 1947 India became a member of the International Monetary Fund (IMF) and the exchange value of the Rupee came to be fixed by IMF standards. But with prices moving upwards, India was obliged to devalue the Rupee by 30.5 per cent on Sept. 18, 1949.

From 1955 onwards Rupee was fighting a battle for survival against the everrising domestic prices. It started losing its value steadily both in the home market and in the international market. This led to a

second devaluation of the Rupee by 57 per cent on June 6, 1966. But the devaluation did not stop the rot. The Rupee continued to fall.

On Sept. 24, 1975 the Government of India decided to de-link the Rupee from the pound and to adopt a basket of currencies instead. The exchange value of the Rupee was thus determined in relation to a 'weighted' average of the currencies of India's leading trade partners.

The contents of the basket of currencies are kept secret; presumably it includes major currencies like US dollar, Pound Sterling and so on even though the ratio of each currency in the basket could not be guessed. The secrecy of the basket gives the arbitrary discretion to the Reserve Bank of India to change the value of the rupee whenever it feels so.

Lowest Value

The real value of the Rupee (base 1960-100) slumped to 14.99 paise in Bangalore in May 1985. Last the highest erosion in the country, according to Labour Bureau, Simla data.

The Rupee was worth 15.6 paise in Bombay, 16.2 paise in Madras and 17.01 paise in Calcutta in the same month.

On an all-India basis, the Rupee was worth 16.7 paise in May.

In Nagpur, Raipur and Hyderabad, the Rupee in May this year was worth 16.29, 16.31 and 16.6 paise, respectively.

In Ahmedabad, the real value of the Rupee has declined to 17 paise and Kanpur to 17.5 paise.

Only in four towns, the real worth of the Rupee exceeds 20 paise. In May last, the Rupee was worth 20.08 paise in Rangpura in Assam, 20.12 paise in Jalpaiguri in West Bengal, 20.41 paise in Ladac in Assam and Darjeeling in West Bengal.

In 25 towns, the real value of the Rupee in May last was less than the all-India value of 16.67 paise. (UNI: July 24, 1985).

Decimal System

The Indian Currency System was converted into the decimal system by the Indian Coinage (Amendment) Act, 1955. The amended Act was brought into force only on April 1, 1957.

The first one-paise coin under the decimal system was issued in March 1962 and the first one Rupee coin in July 1962. From Oct. 1, 1964 the one-digit de-

nominations of one-paise (1p.) and two-paise (2p.) coins were supplimented by the issue of three-paise (3p.) coins.

With the amendment of the Indian Coinage Act, the old system of Rupees, annas, pies 1 Rupee = 16 annas. 1 anna = 12 pies was replaced by the Rupee-paise system and the intermediate coin anna was abolished.

from 1966 to 1969—1966-67, 1967-68 and 1968-69.

Fourth Plan 1969-74. The Fourth Plan (1969-74) officially commenced on April 1, 1969 with the publication of the Draft Plan. *Growth with stability* was the main objective of the Plan. Agriculture was expected to lead the growth with a rate of 5 per cent per annum. Such a growth in agriculture would set up a chain reaction in the economy. The target for the growth rate of industry was set at about nine per cent per annum. Altogether the national income was expected to increase at the rate of 5.5 per cent per annum. Allowing for the increase of population at the rate of about 2.5 per cent, the per capita income was expected to increase at the rate of 3 per cent per annum or about 16 per cent in the Fourth Plan period.

Fifth Plan 1974-79. The Fifth Plan draft as originally drawn up was part of a long term *Perspective Plan* covering a period of 10 years from 1974-75 to 1985-86. The perspective plan attempted to co-ordinate various sectors of the economy in terms of the new slogan *Garibi Hatao* (Remove Poverty). The long term rate of growth which the economy was expected to achieve on a self-sustaining basis was put up at 6.2 per cent per annum.

By the time the Fifth Plan was approved by the National Development Council (Sept. 1976) its premises had become obsolete and the total outlay had to be increased from Rs. 37,463 crore to 39,303 crore.

This belated attempt had an inglorious end in another 6 months, when the Janata party came into power. They scrapped it unceremoniously.

The Janata government reconstituted the Planning Commission and announced a new strategy in planning. The strategy involved a change in objective and pattern. The objective was laid down as *Growth for Social Justice* instead of *Growth with Social Justice*—a distinction without a difference. The new pattern was the *Rolling Plan* which merely meant that every year the performance of the Plan will be assessed and a new Plan based on such assessment will be made for the next year—a continuous planning, in fact. The rolling plan started with an annual plan for 1978-79 and as a continuation of the terminated V plan.

Sixth Plan The Sixth Plan for 1978-83 was revised and released by the Janata government on Dec. 2, 1979. Soon after the release of the revised plan Janata went out of power and a Congress government under Indira Gandhi took over. The Congress government 'rolled up' the Rolling Plan and superseded the 1978-83 Plan by a new Plan for 1980-85.

The Sixth plan was formulated against the background of a perspective covering a period of 15 years from 1980-81 to 1994-95. It took into account the achievements and shortcomings of the past three decades of planning and economic development and difficulties, like acute inflationary pressures, setbacks in critical spheres of economy like power, coal, steel and transport and the steep rise in the price of petroleum products resulting in an increasing deterioration in the terms of trade and balance of payments. "The removal of poverty" said the Plan Document, "is the foremost objective of the Sixth Plan".

The Sixth Plan aimed at a growth in gross domestic product of 5.2 per cent a year and per capita income by 3.3 per cent per annum. Thus by 1984-85 per capita income was expected to reach Rs. 1744 at 1979-80 prices as compared with Rs. 1488 in the base year.

The total plan investment for the period 1980-85 was estimated at Rs. 158,710 crores initially. This was increased to Rs. 20,989 cr. in 1982-83 and further to Rs. 25,495 cr. for 1983-84.

20-Point Programme. The first 20-Point Programme announced on July 7, 1975 was revised nearly seven years after on January 14, 1982. Both programmes were basically formulated with a view to ameliorating the living conditions of the rural poor.

The Revised programme is reproduced below.

1. Increase in irrigation potential and provision of inputs for dry land agriculture.
2. Special efforts to increase production of pulses and vegetable oilseeds.
3. Strengthening and expanding coverage of integrated rural development and national rural employment programmes.
4. Strict implementation of agricultural land ceilings and distribution of surplus land.
5. Review and effective enforcement of minimum wage for agriculture.

ral labour. 6. Rehabilitation of bonded labourers. 7. Accelerated programmes for development of Scheduled Castes and Scheduled Tribes. 8. Supply of drinking water to all problem villages. 9. Allotment of house sites to rural families and construction assistance to them. 10. Improving the environment of slums, house-building schemes for economically weaker sections and measures to arrest unwarranted increase in land prices. 11. Maximisation of power generation, electrification of villages. 12. Vigorous implementation of afforestation, social and farm forestry and development of bio-gas and other alternate energy sources. 13. Promotion of family planning on a voluntary basis as a people's movement. 14. Substantial augmentation of universal primary health care facilities and control of leprosy, TB and blindness. 15. Accelerated welfare programmes for women and children, nutrition programmes for pregnant women, nursing mothers and children, especially in tribal, hill and backward areas. 16. Spread of universal elementary education for children in the 6-14 age group with special emphasis on girls and involvement of students and voluntary agencies in the removal of adult illiteracy. 17. Expansion of the public distribution system, supply of textbooks and exercise books to students on a priority basis and promotion of a strong consumer protection movement. 18. Liberalisation of investment procedure and streamlining of industrial policies to ensure timely completion of projects, all facilities to handicrafts, handlooms, small and village industries to update technology. 19. Continued strict action against smugglers, hoarders and tax evaders and check on black

Demonetisation

There have been two demonetisations in India in recent times, the first in Jan. 1946 and the second in January 1978. In 1946 two ordinances were issued on January 12 the Bank notes (Declaration of holdings) Ordinance 1946 and Bank notes (Demonetisation) ordinance, 1946.

These Ordinances applied only to British India but princely States in India were also persuaded to issue parallel demonetisation Ordinances in their states, so that demonetisation would take effect all over India. The first ordinance called for a declaration of all notes of the value of Rs. 500 and above.

The Indian States which did not issue ordinances demonetising high denomination currency notes were required to exchange their holdings of demonetised notes before the 7th March, 1946.

The total value of high denomination notes exchanged by 31st March 1964 was Rs. 123.37 crores of which as much as Rs. 109.67 crores were exchanged before 26th January, i.e. within a fortnight of the issue of the Ordinance.

The second demonetisation was promulgated on the night of January 16, 1978. This demonetisation, however, affected only notes of the value of Rs. 1000, 500, 10000 while the 1946 demonetisation covered notes of the value of Rs. 500 as well.

money. 20. Improvement in the working of the public sector enterprises.

106. FIFTY YEARS OF RESERVE BANK

The Reserve Bank of India, the monetary authority of the country, crossed 50 years of its existence in 1985. The achievements of this central banking authority in controlling the finances of a country reckoned as among the ten leading industrialised nations of the world has been commendable.

A regular central banking system for the country was first instituted under the Reserve Bank of India Act, 1934. Until then the Imperial Bank of India functioned as a central bank of sorts. But beyond acting as bankers to

the government, the Imperial Bank did little else as a central bank

The Reserve Bank came into existence on April 1, 1935. The Bank was originally constituted as a share holders' bank but was later

converted into a state-owned bank by the Reserve Bank (Transfer to Public Ownership) Act, 1948. The Reserve Bank is divided into two distinct and separate departments, the *Issue department* and the *Banking department*. In addition to these, there is an agricultural credit department, which maintains an expert staff to study all questions of agricultural credit.

Functions. The primary functions of the Reserve Bank are: (1) Issue of paper currency, (2) Acting as bankers to Government including raising of public loans and management of public debt, (3) Controlling the activities of commercial banks, (4) Acting as a bank of accommodation and a lender in the last resort, (5) Maintenance of the external value of the rupee, (6) Provision of agricultural credit, (7) Collection and publication of monetary and financial information.

Under the Reserve Bank of India Act, the joint-stock banks in India were classified as *Scheduled and Non-scheduled Banks*. Scheduled Banks are those with a minimum capital and reserves of Rs. 5 lakhs who having satisfied the Reserve Bank that their affairs are not conducted in a manner detrimental to the interests of the depositors, are included in the Second Schedule to the Reserve Bank of India Act, 1934.

Non-Scheduled Banks are divided into four categories according to their capital: (1) A, with a capital of 5 lakhs and over, (2) B, with a capital between 1 and 5 lakhs, (3) C, with a capital between 50,000 and 1 lakh and (4) D, with a capital of less than 50,000.

Dual Role. The Reserve Bank's role in the Indian economy is dual— promotional and regulatory. In recent years, its promotional role has been more predominant than the regulatory role. It has helped the Government in its development projects by raising loans at fairly low interest and by providing funds for deficit financing.

In developing the money market and the capital market the Reserve Bank's promotional role has been exceptional. In its regulatory role, the Reserve Bank's monetary policy has been oriented to the national objective of economic growth with stability. Even though the conventional weapons of a central bank have only a limited operation in regulating

the monetary system, the selective credit control and other directives issued by the Reserve Bank have had a salutary effect on the economy.

Affiliates. The following institutions are affiliates of the Reserve Bank: (i) *Agricultural Refinance Corporation*, (ii) *Deposit Insurance Corporation* and (iii) *Unit Trust of India*.

The Industrial Development Bank of India (IDBI), originally established in 1964 as an affiliate of the Reserve Bank, was statutorily de-linked from the Reserve Bank in February, 1974.

Legislative Changes. A series of amending acts in 1962, 1963 and 1974 have expanded the jurisdiction and powers of the Reserve Bank, as a banker's bank and the custodian of national credit, even by bringing non-banking companies which receive deposits, under its control and supervision.

The Reserve Bank of India (Amendment) Act, 1974, widened the powers of the bank to provide refinance facilities to scheduled banks and state cooperative banks, enlarged the scope of the term "agricultural operations" widened the scope of the Bank to act as agent so as to enable the Bank to issue and manage bonds and debentures on behalf of statutory corporations, enlarged the list of foreign securities eligible to be held as assets of the Issue Department of the Bank, modified the definition of the term "liabilities", provided statutory protection to banks to exchange freely credit information mutually among themselves and vested the Bank with better powers to exercise control over non-banking institutions receiving deposits.

The Interest Tax Act, which came into operation in Sept. 1974, levied a tax at the rate of 7 per cent on interest earnings of the scheduled banks with effect from the assessment year 1975-76.

The Act was suspended in 1978-79 but revived in 1980-81 and extended to term lending institutions like the Industrial Finance Corporation of India.

The Reserve Bank of India (Amendment) Act, 1978. The Reserve Bank of India (Amendment) Act, 1978, came into force from July 1978.

Briefly, the amendments empower the

Reserve Bank to open gold accounts abroad, invest in securities guaranteed by a foreign government, open accounts with branches of Indian banks abroad and invest in the shares and securities of an international or regional bank or financial institutions formed by foreign governments or principal currency authorities.

The amendment Act also empowers the Reserve Bank to make rupee loans to scheduled banks and certain specified financial institutions to enable them to purchase foreign exchange from the Reserve Bank for financing import of capital goods and for other approved purposes.

The existing stipulation that the Reserve Bank's purchases from or sale to scheduled banks of foreign exchange should be in amounts of not less than the equivalent of one lakh rupees has been removed.

Commercial Banking. There were 10,980 bank branches in India at the end of 1984 at the rate of one bank for every 13,000 of population. This does not mean that commercial banking has penetrated to every corner of the country.

Modern Indian banking originated in the presidency towns of Bombay, Calcutta and Madras. These towns were not only the headquarters of the British Presidencies of Bombay, Bengal and Madras but also the principal British trading centres in India. The British trading houses who carried on business in the presidency towns first started banking as an ancillary of trade. Most of these trading-cum-banking houses came to grief between 1829 and 1832 owing to their participation in speculative trade. Some firms like Grindlays, however, survived and continued to carry on trade and banking together.

The Presidency Banks functioned as bankers to the East India Company at Calcutta, Bombay and Madras. They gradually took over the banking business of the British Agency houses. The Imperial Bank functioned as bankers to the Government of India and the provincial governments and at the same time carried on commercial banking.

Joint-Stock Banking. Meanwhile, in 1860 the principle of joint-stock banking with limited liability was recognised by the Government of India. This opened the way for

Merchant Banking

Merchant Banking is an old term which signifies financing goods in transit and providing financial advice. It is, in other words, what is today described as Consultancy Business. Consultancy functions include everything pertaining to a company from its very formation—preparation of prospectus, issue of shares, syndication of underwriting, negotiation of loans, permits, sanctions and other legal formalities and assistance in every field from choice of technology to the mark of products.

Merchant banking is fairly new in India. It started only in the seventies. The leaders in this matter were the State Bank of India and the public sector banks. Central financial institutions like ICICI, consultancy organisations like the Tatas, brokers' firms and financing agents have followed suit.

The SBI is the largest merchant banker in India.

Considering the innumerable obstacles to the promotion of new enterprises—government regulations, Reserve Bank directives, foreign exchange complications, import and export hurdles—it is well that our banks and other institutions have come forward to help and advise new entrepreneurs. Otherwise, many of the new companies would have been still-born and many more would have died in their infancy.

the emergence of private commercial banks with limited liability. The Bank of Upper India was formed in 1863 and the Allahabad Bank in 1865. By 1894, there were 14 joint-stock banks in India, most of them run by Europeans.

In 1894, the Punjab National Bank, a purely Indian concern, came into being. Other banks followed.

With the end of the War, India witnessed a new spate of banking ventures. The great majority of these new banks were wiped out during the great depression of the thirties.

The Travancore National & Quilon Bank Ltd. (in the princely State of Travancore), one of the banks that outlived the depression, fell a victim to a political vendetta and was compulsorily liquidated in 1938. This started a chain reaction, leading to the closure of as many as 64 banks all over India, Indian joint-stock banking has thereafter progressed without serious setbacks.

In 1955, the Imperial Bank of India was nationalised and re-named the State Bank of India. In 1959-60 the State Bank took over as subsidiaries 7 provincial banks which were originally started as State Banks of the princely States of Hyderabad, Bikaner, Jaipur, Indore, Travancore, Saurashtra, Mysore and Patiala. With this takeover, the State Bank of India emerged as the colossus of Indian banking, with a network of nearly 2,500 branches all over India.

Social Control of Banks. The idea of a social control of banks was a compromise worked out at the Faridabad session of the Indian National Congress in April 1968, between the out-and-out champions of nationalisation of banking and the conservative section advocating a go-slow policy. Social control of banks was given effect to by legislation on Feb. 1, 1969.

The object of the legislation generally was to bring in *socialisation of credit without nationalisation* of banks. This involved the prevention of the exclusive use of bank credit by big business houses and a wider dispersal of credit, so as to direct its flow to priority areas and make it a live instrument of development.

It must be said to the credit of the commercial banks that they acted up to the ideal of social control, long before it materialised into law. They had reconstituted the Boards of Management and realigned their credit schemes.

Nationalisation. Despite all enthusiasm evinced by the banking community to implement the objectives of social control, the idea was abandoned overnight, as it were, and 14 leading banks of the country were nationalised by a Presidential Ordinance on July 19, 1969. The ordinance became law by the *Banking Companies (Acquisition and Transfer of Undertaking) Act,*

1969. This was declared unconstitutional by the Supreme Court on February 10, 1970. On February 14, 1970, the President issued a validating ordinance, renationalising the 14 banks with retrospective effect from July 19, 1969. This ordinance rectified the irregularities pointed out by the Supreme Court and was enacted into law as the *Banking Companies (Acquisition and Transfer of Undertaking) Act, 1970.*

The leading commercial banks, on the eve of nationalisation, numbered fourteen, the oldest being the Allahabad Bank and the biggest, the Central Bank of India.

On April 15, 1980 the President promulgated an Ordinance—*The Banking Companies (Acquisition & Transfer of Undertaking) Ordinance, 1980*—under which 6 leading commercial banks, each with deposits of Rs. 200 crores and above, were nationalised. They are (1) Andhra Bank, (2) Corporation Bank, (3) New Bank of India, (4) Oriental Bank of Commerce, (5) Punjab & Sind Bank and (6) Vijaya Bank.

Profits Fall. The overall profits of 20 nationalised banks as per data furnished by the Reserve Bank of India to the ministry of finance and placed in the Rajya Sabha in 1985 showed a decline of 3.3 per cent to Rs. 57.29 crores in 1984 as against Rs. 59.23 crores in 1983.

Six of the 20 nationalised banks namely, Bank of Baroda, Bank of Maharashtra, Central Bank of India, New Bank of India, Dena Bank and United Bank of India showed a decline, while the rest showed higher profits in 1984 than in the previous year.

Those nationalised banks which registered an increase of more than 5.0 per cent in their profits during 1984 were: Allahabad Bank (5.9 per cent); Andhara Bank (6.5 per cent); Canara Bank (11.1 per cent); Corporation Bank (18.3 per cent); Oriental Bank of Commerce (13.9 per cent); Punjab National Bank (5.6 per cent); Union Bank of India (7.2 per cent) and United Bank of India (13.2 per cent).

In terms of decline in profits, New Bank of India came at the top with a fall of 50.0 per cent, followed by Bank of Maharashtra (37.8 per cent); Dena Bank (32.5 per cent); Central Bank of India (23.3 per cent); Bank of Baroda

Profits of 20 Nationalised Banks

(Rs. crores)

Name of the banks	1983	1984
1. Allahabad Bank	1.70	1.80
2. Andhra Bank	2.48	2.64
3. Bank of Baroda	8.60	7.01
4. Bank of India	5.11	5.30
5. Bank of Maharashtra	1.93	1.20
6. Canara Bank	4.96	5.51
7. Central Bank of India	3.99	3.06
8. Corporation Bank	0.93	1.10
9. Dena Bank	1.20	0.81
10. Indian Bank	1.40	1.41
11. Indian Overseas Bank	4.73	4.82
12. New Bank of India	0.72	0.36
13. Oriental Bank of Commerce	0.72	0.82
14. Punjab and Sind Bank	0.62	0.65
15. Punjab National Bank	8.53	9.01
16. Syndicate Bank	4.94	5.08
17. Union Bank of India	2.90	3.11
18. United Bank of India	1.36	1.18
19. United Commercial Bank	2.36	2.36
20. Vijaya Bank	0.05	0.06

Source Question-Answer paper placed before the Rajya Sabha on Aug 13, 1985.

(18.5 per cent) and United Bank of India (13.2 per cent).

Top Rank. In terms of absolute profits in 1984, top-notch was Punjab National Bank, accounting for 16.0 per cent of the aggregate profits in that year. Following the Punjab National Bank were: Bank of Baroda (12.2 per cent of the total); Canara Bank (9.6 per cent); Bank of India (9.3 per cent); and Syndicate Bank (8.9 per cent)—all of which had profits in 1984 exceeding Rs. 5 crores each. Vijaya Bank which showed 20.0 per cent in profits during 1984 had in absolute terms, the least profits of Rs. 0.06 crore among the 20 nationalised banks.

According to the latest published report on *Trend and Progress of Banking in India* for the year 1983-84, the profit of the 20 nationalised banks had risen from Rs. 26.5 crores in 1980 to Rs. 29.5 crores in 1981; and further to Rs. 37.3 crores in 1982. Profit figures relating to these banks placed before the Rajya Sabha in 1985 showed that they had increased their profits by almost 59.0 per cent during 1983 before registering a fall of 3.3 per cent during 1984.

State Bank of India. The State Bank of India is the successor of the Imperial Bank of India. The establishment of the Reserve Bank of India in 1934 necessitated a change in the status of the Imperial Bank. This was done by the *Imperial Bank of India (Amendment) Act, 1934*. By this amendment, the Imperial Bank lost its status as a central bank but remained the sole agent of the Reserve Bank, where the latter had no offices of its own. At the same time, the Imperial Bank was given all freedom to function as a commercial bank and to enter into foreign exchange business.

Under the *State Bank of India (Subsidiary Banks) Act, 1959*, the State Bank took over the control of 8 banks: [See next page]

The State Bank of India, its 7 subsidiaries, the 14 banks nationalised in 1968 and the 6 banks nationalised in 1980 are now collectively called *Public Sector Banks*.

The main objective of the nationalisation of the leading commercial banks was to initiate a new banking policy. The new policy aimed at rechannelling bank credit from big industries to small sectors or as R. K. Talwar the

Subsidiary Banks

	Established in	Constituted as State Bank's Subsidiary	Name of the Subsidiary
Hyderabad State Bank	1942	1-10-1959	State Bank of Hyderabad
Bank of Jaipur	1943	1-1-1960	State Bank of Jaipur†
Bank of Bikaner Ltd.	1944	1-1-1960	State Bank of Bikaner
Bank of Indore Ltd.	1920	1-1-1960	State Bank of Indore
Travancore Bank Ltd.	1940	1-1-1960	State Bank of Travancore
Bank of Mysore Ltd.	1913	1-3-1960	State Bank of Mysore
Bank of Patiala	1917	1-4-1960	State Bank of Patiala
State Bank of Saurashtra (formerly known as Bhavnagar Darbar Bank)	1902	1-5-1960	State Bank of Saurashtra

† State Bank of Jaipur subsequently merged with State Bank of Bikaner with effect from 1-1-1963 and the new subsidiary was renamed as "State Bank of Bikaner and Jaipur".

then Chairman of the State Bank of India, put it "to the small man in business, industry and agriculture." The new policy called for many innovations. In the first place, "the small men"

were scattered all over the country. They had to be identified and reached. This meant that banks should branch out into every nook and corner of India.

The new policy involved a right-about turn for the old commercial banks. They had to discard their urban and elitist outlook and become ruralised and mass-based. The banking policy in general had to be given an entirely new lead.

Fast Growing

The State Bank of India is the eleventh fastest growing bank in the world in terms of growth in assets and fourteenth in growth in deposits according to a survey conducted by the Institutional Investor Magazine.

In terms of its total deposits, however, the State Bank stands a poor 78 on the list of top 100 banks of the world.

It is interesting to note that while as many as 25 Japanese banks figure in the list of the world's top 100 banks, only 15 American banks make the list.

The Bank of America, however, continues to be the world's largest bank with over 95,000 million dollars in deposits.

India is the only country in Asia, other than Japan, to figure in the list of the top 100.

The only other two banks outside of Europe and America that appear on the list are Bank Hapoalim of Israel and National Commercial Bank of Saudi Arabia which rank 89 and 96 respectively.

Lead Banks. The lead bank system was introduced in 1969. It was based on the concept of what may be called 'area banking'. Each lead bank is allotted a district or districts in different places. The lead bank had the primary responsibility to study the conditions in the area allotted to it and prepare a development plan taking into account the existing credit set-up in the area and providing for filling up territorial or sectoral credit gaps. The plan had to coordinate the credit policies of all institutions in the area. The first lead banks chosen were the State Bank of India, its 7 subsidiaries, the 14 nationalised banks (1968) and 2 non-nationalised scheduled banks.

The first obvious step in ruralising banking was to open branches in unbanked and poorly banked areas. Till 1968 commercial banks had confined their branches to urban or semi-urban centres only. But even here a very conservative policy was adopted. This is reflected in the fact that the maximum number of branches opened in any one year

by the commercial banks came only to 677 and that in 1968 when 14 private banks were nationalised. From 1969 onwards a new dynamism appeared in branch banking. While in 1969, rural branches accounted for roughly 22 per cent of the total number of branches, in 1980 the rural branches increased to 46.6 per cent.

Similarly, a greater number of branches were opened unbanked or poorly banked States. Thus Assam, Bihar and Orissa, notoriously backward in banking, increased their branch strength by 530,596 and 715 per cent respectively, compared to fairly well-banked states like Maharashtra (195 per cent), Gujarat (196 per cent) and Kerala (262 per cent).

107. TRADE: THE WIDENING GAP

India's exports registered an increase of 20% during 1984-85. But, the galloping increase in imports in the wake of liberalised import policy led to a trade deficit of over Rs. 3000 crores in the first 4 months of 1985. In this rate, the trade deficit might increase to around 7000 crores in 1985-'86 against the revised estimate of Rs. 5325 crores.

According to provisional figures available, India's exports and imports for 1984-85 were Rs. 11,395.98 crores and Rs. 15,591.86 crores respectively.

When compared with the export of Rs. 9,168.25 crore and import of Rs. 15,382.16 crore during 1983-84, exports during 1984-85 registered a rise of 20.4 per cent, and imports a rise of 7.9 per cent, thus reducing the balance of trade deficit during the year to Rs. 5,196 crore from Rs. 5,914 crore in 1983-84.

Rising Demand. The country is generally having adverse balance of trade owing to an increase in imports needed to meet the requirements of development accompanied by relatively slow growth of exports in the background of large domestic market with rising demand.

At times, there have been periods when India's foreign trade witnessed modest surpluses. In 1972-73, as a result of an appreciable increase in exports, the balance of trade turned into a favourable one for the first time in 26 years.

It was once again 1976-77 when India's trade was in surplus to the extent of Rs. 68.92 crore due to faster growth in the exports and a slight fall in imports. The subsequent years were marked by rising trade deficit. India's external trade and balance of payment situation has been under severe strains since 1979-80.

During this period, there has been a sharp increase in India's foreign trade deficit,

chiefly on account of disproportionate rise in import bill in the wake of steep hike in world prices of major imports, particularly those of petroleum and petroleum products.

Weak Economy. The deficit of foreign trade which stood at Rs. 1,085 crore in 1978-79 increased to Rs. 2,724 crore in 1979-80 and to Rs. 5,838 crore in 1980-81. The growth of exports during 1980-81 was hampered by the poor performance of Indian economy in 1979-80 and the first half of 1980-81 under the effects of droughts, characterised by low production levels, lack of infra-structural facilities for export production and domestic inflation.

The resultant domestic shortages also necessitated higher imports of essential commodities which inflated the import bill. The international environment was also not conducive to growth of exports following world recession, prevalence of fluctuating exchange rate and new type of tariff, non-tariff and other protectionist measures followed by developed countries. However, as a result of various measures taken by the government in the direction of export production and export marketing, 1981-82 and 1982-83 showed distinct improvement in the performance of India's foreign trade.

The total turn-over of India's foreign trade (imports plus exports including re-exports) is steadily rising and it has more than doubled in the course of five years from a level of Rs. 11,428 crore in 1977-78 to Rs. 23,194 crore in 1982-83. The trade turn-over on provisional

INDIA'S FOREIGN TRADE

(Value Rs. Crores)

Year	Export	%age increase over the previous year	Imports	%age increase over the previous yearz	Balance of Trade
1977-78	5407.87	+5.2	6020.23	+18.7	-612.36
1978-79	5726.07	+5.9	6810.64	+13.1	-1084.57
1979-80	6418.43	+12.1	9142.58	+34.2	-2724.15
1980-81	6710.70	+4.6	12549.15	+37.3	-5838.45
1981-82	7805.90	+16.3	13607.56	+8.4	-5801.65
1982-83	8834.21	+13.2	14359.99	+5.5	-5525.78
1983-84*	9726.80	+10.1	15587.77	+8.5	-5860.97

* Updated till December, 1984

basis further increased to Rs. 24,743 crore in 1983-84.

Inland Trade of India is gigantic compared to which its foreign trade is small. However, no statistics about the total volume of inland trade is available. In 1947, the Planning Commission estimated that India's inland trade was about Rs. 7,000 crores whereas its foreign trade amounted to about Rs. 350 crores. If this proportion is any guide, the total value of India's internal trade today must be fantastic considering the expansion of its extenal trade.

A vast internal market is an advantage and a liability. The advantage is that there is a big home market to support large scale production, without fear of foreign competition. The liability is that domestic producers have to cater to the varied demands of a huge population. The advantage has been fully exploited, the liability has never been properly discharged. Once the home market was protected, the entire country lay at the mercy of the domestic producers.

Domestic production (agricultural and industrial) failed the home market both in quantity and quality. Agricultural production depended on the weather and its ups and downs are unpredictable. But industry cannot claim any such alibi. Nevertheless, shortfalls in industrial production plagued the economy from time to time. Simultaneously quality suffered too. Shoddy goods filled the market.

Razor blades are a case in point. The import of blades was stopped in the fifties. Indian producers promptly came on the

scene. They filled the country with blades which were no better than hacksaws but were priced at the standard rates. The blades improved slightly in course of time but still continued to give poor service. In May 1981, the government announced that new licenses for the manufacture of blades were being issued, even though the approved capacity was far in excess of the demand.

It is the persistent poor quality of the blades that prompted the government to take this unusual step. What is true of blades is true of almost every consumer article produced in India. The total result was that the common man found it difficult to obtain essential goods at reasonable prices. This is what led to the Essential Commodities Act, 1955 and to the formation of the Ministry of Civil Supplies in 1980.

Essential Commodities are goods declared as essential under the Essential Commodities Act, 1955. Under this Act the Government has powers to declare any commodity as essential, at any time. The list of essential commodities notified under the Act can be increased, reduced or altered from time to time according to the discretion of the Government. In 1980, 65 commodities stood listed as essential commodities under the Act.

Civil Supplies comprise articles of mass consumption, particularly the following Food-grains, Vegetable oils, Sugar, Babyfoods, Drugs, Soap, Textiles, Matches, Kerosene and Diesel oil, Paper and Stationery, Cycle tyres and tubes, Soda ash, Dry cells or

torches, Electric lamps, Hurricane lanterns, Milk, Foot-wear, Razor blades, Household utensils and Bicycles.

The Act was amended through legislation enacted in the 1981 Monsoon Session of the Parliament.

The amendment among other things provides for a summary trial of all offences under the Act, for a minimum mandatory imprisonment for a period not less than 3 months, making all offences under the Act non-bailable and barring appeals to a judicial authority.

Public Distribution. A public distribution system was found necessary because the free market system has been found wanting in protecting the interests of the low income consumers. The public agencies of the Central and State Governments are required to arrange for procurement, stocking and distributing of various essential commodities, through the approved outlets, to meet the requirements of the common man.

Public distribution systems is an integral part of the Plans and is being developed as such. The co-operatives are being organised to form the bulwark of the public distribution system. The cooperative distribution system

of consumer articles comprises consumer cooperatives in urban areas and agricultural service and marketing cooperatives in rural areas. The consumer cooperative structure is a four-tier system comprising the National federation, State federations, central society at the district and primary society at the base levels.

Sustained efforts were made to strengthen the consumer cooperative network in the country in order to support the Public Distribution System. The Consumer Cooperatives in urban areas were oriented towards increasing coverage of weaker sections and achieving higher efficiency for greater consumer satisfaction by making available quality goods at reasonable prices.

lower than the performance in 1980. The combined GDP growth of industrial countries slowed down from 1.5% in 1980 to 1% in 1981. The value of world trade in 1981 at nearly \$ 2000 billion was 1% less than in 1980 and in volume terms the world trade in 1981 stagnated.

The improvement in India's foreign trade situation during 1982-83 was maintained during 1983-84, despite the recession in the world economy and the near stagnation in international trade flows.

Imports and Exports

(Value in Rs. crore)

Year	Imports	Exports (including re-exports)	total value of foreign trade	Balance of trade
1950-51	650.21	600.64	1250.85	-49.57
1960-61	1,139.69	660.22	1799.91	-479.47
1970-71	1,634.20	1,535.16	3169.36	-99.04
1971-72	1,824.54	1,608.82	3433.36	-215.72
1972-73	1,867.44	1,970.83	3838.27	+103.39
1973-74	2,955.37	2,523.40	5478.77	-431.97
1974-75	4,518.78	3,328.83	7847.61	-1,189.95
1975-76	5,264.78	4,036.26	9301.04	-1228.52
1976-77	5,073.79	5,142.71	10216.50	+68.92
1977-78	6,020.23	5,407.87	11428.10	+612.36
1978-79	6,810.64	5,726.07	12536.71	-1084.57
1979-80	9,142.58	6,418.43	15561.01	-2724.15
1980-81	12,549.15	6,710.70	19259.85	-5838.45
1981-82	13,607.56	7,805.90	21413.46	-5801.66
1982-83	14,359.99	8,834.21	23194.20	-5525.78
1983-84	15,587.77	9,726.80	25314.57	-5860.97

1. 1983-84 figures are provisional and updated till June 1984

108. ENERGY

Energy requirements in India is met from a variety of sources—firewood, animal dung, agricultural wastes, electricity, nuclear fuels, oil and coal. While non-commercial forms of energy meet the bulk of rural requirements, electricity, coal and oil remain the most widely tapped.

In view of the high increase in oil prices, non-conventional power source like solar energy, tides, winds and geo-thermal energy are being investigated by countries which are not petroleum exporters. India has taken up investigation of tidal energy and geo-thermal energy (energy from the internal heat of the Earth).

The available resources, namely, oil, coal and water power are, however, unevenly distributed in the country. While Kerala, Karnataka, J and K, Assam, H. Pradesh and Arunachal Pradesh have abundant hydro-electric power but little or no reserves of coal, W. Bengal and Bihar have large reserves of coal, but very little hydro power.

Electricity. The administration of Electric power (generation, transmission and distribution) is governed by two legislative enactments, the Indian Electricity Act 1910 and the Electricity (Supply) Act 1948.

The Central Electricity Authority, established in 1950 under S.3(i) of the Electricity Supply Act, 1948 is responsible for evolving a long term power policy co-ordinating the activities of the Regional and State Electricity Boards and supervising the execution of all power projects in the country.

Regional Electricity Boards were set up in 1964 in each of the five regions to bring about voluntary co-operation between the states for developing regional grids and promoting coordinated operations of power systems.

The five Regional Electricity Boards are: Northern Regional Electricity Board covering Haryana, Himachal Pradesh, Chandigarh and Delhi; Western Regional Electricity Board covering Gujarat, Madhya Pradesh, Karnataka, Kerala, Tamil Nadu and Pon-

dicherry; Eastern Regional Electricity Board covering Bihar, Orissa, West Bengal, Sikkim and Damodar Valley Corporation System; and North-Eastern Regional Electricity Board covering Assam, Manipur, Meghalaya, Nagaland, Tripura, Arunachal Pradesh and Mizoram.

Boards. State Electricity Boards have been established in 18 out of the 22 states and they are mainly responsible for generation and distribution of electricity in their respective states. States in which Electricity Boards are yet to be established are Manipur, Tripura, Nagaland and Sikkim. In these states, the State Governments (and not Boards) have the responsibility for power development.

The Pattern of power development in India is as follows. The states of Karnataka, Kerala, Punjab, Orissa and J and K develop mainly hydropower; Bihar, West Bengal, Gujarat and Rajasthan mainly thermal power; Maharashtra, Tamil Nadu, AP, UP, Assam and MP are partly thermal and partly hydro. The ultimate form of power supply will be an *All-India Grid* of interconnected hydro electric and thermal power stations in all the regions.

The all-India grid will be under the Super Grid Directorate in the Central Electricity Authority, which will co-ordinate the activities of the Regional Boards.

Power Generation. The target for power generation during 1984–85 was fixed at 154 billion units. Of this 98.5 billion units were to be generated by thermal stations, 3.5 billion units by nuclear plant and 52 billion units by hydro stations.

Upto the end of February, 1985, 89.13

billion units were generated by thermal stations, 3.63 billion units by nuclear plants and 49.77 billion units by hydro stations. This represents an overall increase of 12.5% over the generation of the corresponding period of the previous year. The increase in terms of thermal generation nuclear generation and hydro generation was 14.86, 13.7% and 8.6% respectively.

Hydro Resources: Hydro power constitutes the most economic source of power development in the country. Its intrinsic economic value has been further enhanced as a result of recent increase in the price of oil and coal. Hydro-electric power stations contribute about 40 per cent to the total present production of electrical energy in the country.

On a rough calculation on the basis of data compiled, the total hydro potential in the country has been tentatively assessed to be over 45 million KW at 100% load factor, corresponding to over 75 million KW at 60% load factor and nearly 150 million KW at 30% load factor.

Thermal Stations. Coal is the largest naturally occurring source of commercial energy in India and is one of the principal sources of power production. At present, coal-based thermal plants contribute about 56.6 per cent of the total power generation.

Most of the thermal stations are coal-based. There are seven thermal stations which use oil. Gas is used only by two stations. The capacity of a thermal plant is determined by a number of factors, such as the need for annual maintenance of boiler, uniformity in load conditions, forced outages, etc. Thermal stations, in an interconnected system, may be expected on an average to generate 4500 G.W.A. per Kw.

Nuclear power generation was initiated in India in 1969 with the commissioning of the Tarapur Atomic Power Station with an installed capacity of 420 MW. The following nuclear power stations are new ones:

Rajasthan Atomic Power Station (near Kota) (RAPS)	2 × 220 MW
Madras Atomic Power Station (near Kalpakam) (MAPS)	2 × 235
Narora Atomic Power Station (UP) (NAPS)	2 × 235 MW

Rural Electrification

	Rural villages Electrified	Electrification Pumpsets Energised
March-1951	3,061	21,008
March-1961	21,754	198,904
March-1971	106,774	1,571,000
March-1974	156,729	2,426,133
March-1980	250,112	3,949,120
March-1981	272,625	4,330,437
31-1-1984	3,33,879	5,177,477

Rural Electrification involves supply of electric energy mainly to two types of programmes:

(a) Production-oriented programmes like minor irrigation, rural industries, etc., and (b) village electrification. At the time India attained independence in 1947, only about 1500 villages and about 6430 pumpsets were provided with electricity. With the beginning of the Five-Year Plans in India, more emphasis was laid on Rural Electrification and considerable investment was made in this respect. As a result of this, the number of villages electrified and pumpsets energised have increased steadily over the years.

Non-conventional Energy. In September, 1982, a new department, called Non-conventional Energy Sources was created under the Ministry of Energy. This department attends to what have been called Additional Source of Energy in India.

India with its large cattle population and agricultural base has a sizeable *biogas* potential which can be harnessed to meet the energy need, specifically of rural areas. The technology of bio-gas and associated manure production has been developed indigenously.

The Khadi and Village Industries Commission (KVIC) has taken up the responsibility of popularising Bio-Gas in rural areas.

Solar energy. India receives substantial quantities of solar radiation and the number of sunny day in the year are high.

The minimum radiation occurs in December and for most locations it is about 500 cal/per sq cm/day. The intensity and distribution of solar energy are favourable for its

use in India. The Government attached considerable importance to harnessing non-conventional and renewable sources of energy. Solar energy and bio-gas offer the greatest scope under conditions obtaining in our country and very high priority has been accorded for their development.

An interated research programme involving several agencies has been undertaken by the department of Science and Technology.

Coal The all india production of coal during 1984-85 reached an all time high level of 147.45 million tonnes. Of this production from the public sector undertaking Coal India mines accounted for 130.85 million tonnes. The corresponding figures for 1983-84 were 138.22 million tonnes and 121.41 million tonnes respectively. This represents a growth rate of 6.7% in respect of all India coal production and a 7.7% growth in CIL production.

According to Seventh Plan, the production of coal by 1989-90 is expected to go up to 226 million tonnes.

Coal, including lignite, comprises the largest single source of energy in India. It is estimated to contribute nearly two-thirds of India's total supply of commercial energy.

The coal reserves are now estimated at 120,105 million tonnes of which the Gondwana coal accounts for 1,19,211 million tonnes and the tertiary coal 894 million tonnes. The proved, probable and possible reserves account for 23 per cent, 37 per cent and 40 per cent of the reserves respectively. The state-wise assessment of reserves is as under:-

Mining Organisation. Consequent on the nationalisation of coal mining the Government of India re-organised the entire mining structure with the view of facilitating a rapid expansion of coal industry to meet the increasing demands of the country.

On Nov. 1, 1975 *Coal India Ltd.* was set up as a holding company with headquarters at Calcutta with five subsidiary companies, namely, *Bharat Coking Coal Ltd.*, *Cental Coalfields, Ltd.*, *Western Coalfields, Ltd.*, *Eastern Coalfields, Ltd.*, and *Central Mine Planning and Design Institute Ltd.* There are now one holding company and 4 coal producing companies and one subsidiary com-

Gondwana Coal	million tonnes
(a) West Bengal	29,759.18
(b) Bihar	50,489.97
(c) Madhya pradesh	20,344.42
(d) Orissa	6,979.79
(e) Maharashtra	3,015.20
(f) Andhra Pradesh	8,622.35
	1,19,210.91
Tertiary Coal	
(a) Arunachal Pradesh	91.00
(b) Assam	282.13
(c) Meghalaya	393.72
(d) Nagaland	12.05
	778.90
Grand Total	1,19,989.81

pany, namely, CMPDIL, which is looking after the work of planning and design of mining projects.

The authorised capital of Coal India has been raised to Rs. 3000 crores.

Lignite. Lignite, also known as brown coal, though inferior to bituminous coal in calorific value, is used for generation of power and production of briquettes for domestic use. It is also used for production of urea.

The average calorific value of lignite is around 24,000 K. Cal/kg. Though it has a high percentage of moisture (50 to 60 per cent), the ash content is low, 3-6 per cent.

Neyveli, a small village in the District of South Arcot of Tamil Nadu State, sprang into limelight overnight in the early 1950's when lignite was discovered. On investigation a reserve of 2000 million tonnes of lignite was estimated to be available at Neyveli. Further investigations were continued and as on date (1985) the estimated reserves extend to 3300 m.t.

Neyveli Lignite Corporation was registered as a public sector company in November 1956, with the object of taking over, implementing and managing the integrated project consisting of an opencast lignite mine with an ultimate capacity of 6.5 m.t. of lignite

Petroleum: 1984-85 at a Glance

• **Exploration**—Oil and Natural Gas Commission and Oil India Ltd. continued exploratory work, both offshore and onshore. The major achievements of this year were discovery of oil at Dahej in Gujarat and Changmaigaon in Assam. Gas was struck at Rokia in Tripura and Kaikalur in Andhra Pradesh. In the offshore areas, oil was struck in structure B-178 in the West Coast, KD-I in Kutch offshore and Kovil-Kallapal in Cauvery Basin.

• **Production, Import & Export**.—The indigenous production of crude is expected to be of the order of 29.43 MMT consisting of— (1) Assam fields — 5.23 MMT, (2) Gujarat fields — 3.90 MMT, (3) Bombay High — 20.30 MMT. Total: 29.43 MMT.

To meet the demand of indigenous refineries 14.1 MMT of crude oil is proposed to be imported. Against this import 7.00 MMT of Bombay High crude which cannot be processed in the indigenous refineries is proposed to be exported during 1984-85.

• **Refinery Throughput**—The crude throughput for 1984-85 is estimated at

34.77 MMT. Refinerywise throughput will be as follows:

Hindustan Petroleum Corporation, Bombay 3.01; Bharat Petroleum Corporation, Bombay 4.94; Cochin Refineries Ltd., Kerala 1.06; Madras Refineries Ltd., Madras 3.49; Vizag Refinery 1.92; Haldia Refinery 2.37; Koyali Refinery 6.85; Mathura Refinery 5.72; Barauni Refinery 3.09; Guwahati Refinery 0.80; Assam Oil Division, Digboi 0.52; Bongai-gaon Refineries and Petrochemicals Ltd. 1.00; Total: 34.77.

• **Demand, Production & Import**.—Consumption of petroleum products during the year is expected to be of the order of 38.44 million tonnes, recording a growth of 7.2% over last year's consumption.

Growth for the major products will be as follows: 1. Motor Spirit 8.4%; 2. Aviation Turbine Fuel 9.7%; 3. Kerosene 8.0%; 4. High Speed Diesel 6.9%.

To meet the demand in excess of indigenous production, the following products are proposed to be imported during the year. 1. Aviation Turbine Fuel/Kerosene 3.07 MMT; 2. HSD/LDO 3.05 MMT; 3. FO/LSHS 0.33 MMT; Total: 6.45 MMT.

per annum, a 600 MW thermal power station, a fertilizer plant with a rated capacity to produce 1.52 lakh tonnes of urea per year, a briquetting and carbonisation plant to produce 3.27 lakh tonnes of carbonised briquettes per annum and a clay washing plant with a capacity of 6000 tonnes of washed clay per annum.

Expected production of lignite in 1984-85 is 69 lakh tonnes. Actual production in 1984-85 (upto Dec. 1984): 52.21 lakh tonnes.

Oil and Gas. Although oil was discovered in Assam in 1867, some seven years after the first oil well in USA was opened in Pennsylvania by Col. Drake, no effort was made either to augment Assam production or to enquire into its potentialities. It was only in

1955 that the Government of India formed a Directorate under the then Ministry of Natural Resources and Scientific Research to investigate into the country's oil resources.

In 1956 the Directorate was elevated to the status of a Commission. In 1959 the Commission was converted into a statutory body by an Act of Parliament. This is the Oil and Natural Gas Commission.

The Oil and Natural Gas Commission (ONGC) is the principal agency engaged in the exploration, development and production of crude oil and natural gas in the country. Its field of activity extends over the entire territory of India including the continental shelf. Some areas presently operated the Assam Oil Company and Oil India Ltd

Refineries and Capacities

Name of the Company	Location	Installed capacity (in million tonnes)
1. Indian Oil Corporation Ltd.	Gauhati	0.85
2. Indian Oil Corporation Ltd.	Barauni	3.30
3. Indian Oil Corporation Ltd.	Koyali	7.30
4. Indian Oil Corporation Ltd.	Haldia	2.50
5. Indian Oil Corporation Ltd.	Mathura	6.00
6. Indian Oil Corporation Ltd. (Assam Oil Division)	Digboi	0.50
7. Madras Refineries Limited	Madras	2.80
8. Cochin Refineries Limited	Cochin	3.30
9. Bharat Petroleum Corpn. Ltd.	Bombay	5.25
10. Hindustan Petroleum Corpn. Ltd.	Bombay	3.50
11. Hindustan Petroleum Corpn. Ltd.	Vizag	1.50
12. Bongaigaon Refinery & Petrol-chemicals Ltd	Bongaigaon	1.00
		37.80

are beyond the purview of the ONGC.

The ONGC produced 23.15 million tonnes (5.76 MMT onshore and 17.39 MMT offshore) of crude oil and condensate during 1983-84. During the same period the ONGC supplied 2223 million cubic metres of natural gas to various consumers.

Oil India Limited (OIL) was formed in February, 1959 for exploration and production of crude oil (including natural gas) in Assam and Arunachal Pradesh in collaboration with Burmah Oil Company Limited. With effect from 14th October 1981 the Government has taken over 50 per cent of shares of Oil India Limited held by Burmah Oil Company Limited and the Indian assets and Burmah Oil Company (India Trading Limited, for a total consideration of Rs. 21.56 crores.

With the takeover of the Assam Oil Company, the Burmah Oil Company (India Trading) Limited and 50 per cent shares of Oil India Limited (owned by Burmah Oil Company Limited) the oil industry in the country is entirely in public sector.

The Institute of Petroleum Exploration at Dehra Dun carries out basic and applied research in petroleum. They have identified 27 basins covering a total sedimentary area of about 1.4 million sq. km on land and about

0.26 million sq km offshore. The Brahmaputra Valley in Assam and Cambay in Gujarat have proved to be rich in oil and gas. The actual exploration is carried out by ONGC and OIL India both onshore and offshore.

Refining & Distribution. The total refining capacity in the country at present in terms of crude output is 37.80 million tonnes per annum. There are 12 refineries in operation. With the takeover of Digboi refinery of the Assam Oil Company on October 14, 1981 all the refineries are in the public sector.

The Indian Oil Corporation Limited was set up on September 1, 1964 by amalgamating the Indian Oil Company Limited to secure effective co-ordination and control between the refining and marketing activities of the two companies.

Bharat Petroleum Corporation Limited. The issued and subscribed share capital of the company is Rs. 23.00 crores and the paid up share capital Rs. 14.54 crores. All the shares are held by the Government of India.

Hindustan Petroleum Corporation Limited. The issued and subscribed share capital of Hindustan Petroleum Corporation Limited (HPCL) stands at Rs. 15.20 crores made up of 1,52,000 equity shares of Rs. 1000/- each.

Cooking Gas. LPG availability increased from 616,000 tonnes in 1982-83 to 90,000 tonnes in 1983-84, recording an increase of 20.7% over the previous year. During 1984-85 the availability of LPG is estimated to be 962,000 tonnes.

There are more than 80 lakh domestic users of LPG in the country. The enrolment programme and achievements against the target under the Phase III Project are as follows: (Figures in lakhs).

Increasing use of LPG in the domestic sector results in the saving of valuable

Year	Target	Actual
1982-83	14.00	14.10
1983-84	16.00	16.00
1984-85	14.50	11.83 (up to 31-12-84)
1985-86	17.50	—

foreign exchange through reduced pressure on kerosene. Apart from the domestic sector, LPG is released for industrial use only on technological grounds, i.e., where no other fuel can be used.

109. ATOM FOR PEACE

Notwithstanding the political question whether India will make the atom bomb or not, the country is fast advancing in the field of nuclear energy development. Ever since the experimental nuclear explosion at Pokhran Rajasthan in May 18, 1974, the question of India going in for the bomb has been raised day in and day out by many around the world.

When US, Canada and France, the countries that co-operated with India in the nuclear field, made a hue and cry, there was no way other than India going it alone in the development of nuclear energy for peaceful purposes.

In the wake of Pakistan's all-out efforts to manufacture an 'Islamic bomb' and the super-secret developments at their nuclear research centre at Kahuta, off Islamabad, the bomb bogey became vociferous once again, and the government leaders had to shout the political slogan that India would not hesitate to make the atomic bomb if it was compelled to do so.

However, Prime Minister Rajiv Gandhi while dedicating the three atomic reactors at Kalpakkam to the nation and renaming the research centre as '*Indira Gandhi Atomic Research Centre*', on Dec. 16, 1985, unequivocally declared, "our abhorrence of nuclear weapons for war is total."

Milestone. India's nuclear programme has come of age. The formal dedication of the nation of the Fast Breeder Test Reactor (FBTR) at Kalpakkam marks a milestone in the building of an advanced and indigenous nuclear industry. The FBTR, coming in the

wake of the recent commissioning of MAPP-I* and MAPP-II at Kalpakkam and the Dhruva research reactor at Trombay, implies that the troubles that plagued the nuclear programme in the 1970s are now well behind.

These recent successes have been achieved against great odds—political pressure and denial of technology by the big powers. It might be recalled that Canada broke its nuclear relationship with India and France refused to honour its commitments to the FBTR. The determination and self-confidence of the Indian scientific community in putting the nuclear programme back on the rails is only too obvious.

The Fast Breeder Test Reactor of Kalpakkam is entirely designed by Indian Scientists and uses locally-mixed carbide fuel with a plutonium and uranium base, instead of enriched uranium which the country has been obtaining from abroad with great difficulty.

There are only six countries—the United States, the Soviet Union, France, Britain, West Germany and Japan—that are ahead in fast breeder technology, which promises to

*MAPP- Madras Atomic Power Plant

be the main source of nuclear power in future.

From Monazite. The ultimate plan of Indian scientists is to use thorium, which can be extracted from monazite, radio active sand, as fuel, when fast breeder reactors go into commercial production.

Splitting of the plutonium atom provides the heat that is harnessed for electricity generation. Initially, the fast breeder reactor will run on low power to enable scientists to test various systems. Full power is likely to be reached some time in 1986.

The fast breeder reactor is different from the conventional heavy water reactors. Plutonium is the fuel used in the reactors rather than natural uranium which is the staple for a heavy water reactor. The fast breeder reactor converts the non-fissile content of natural uranium fuel—the isotope of U-238—into plutonium.

13-year Search. The fast breeder reactor is a major milestone in the 13-year-long research and development of a technology which the nations possessing it were unwilling to divulge.

Though India did have the benefit of a French design when the construction of the fast breeder reactor started in 1972, a number of modifications and adaptations were carried out indigenously.

A major departure from the French design was the nature of the fuel itself.

The enriched uranium-plutonium oxide fuel that French experts used was unsuitable, for India did not have a fuel-enrichment facility. Therefore, Indian scientists opted for a plutonium carbide combination.

No other country has yet tested out a fuel core entirely made of the carbide and the performance of the fast breeder test reactor is being watched with world-wide interest.

Dhruva Reactor. The Dhruva reactor at Trombay which became critical in 1985 is another great achievement of India's nuclear programme for peaceful purposes. It is perhaps the only high power reactor in the world today. The main functions of this reactor are isotope production, fuel and materials testing and basic research in physics, chemistry and biology.

Beginning with Apsara commissioned in 1956, the Bhabha Atomic Research Centre (BARC) at Trombay has built four other nuclear research reactors and Dhruva is the fifth one—a 100 MW heavy water moderated and cooled thermal reactor designed and built in India.

Construction of the reactor was started on October 30, 1975, on the birth anniversary day of late Dr. Homi Bhabha, architect of India's nuclear programme.

Isotope production and dispensing form a large area of the BARC activity which has benefited the industry as well as the common man. In the area of medicine BARC labelled compounds and radiopharmaceuticals have been utilised in the diagnosis and treatment of diseases benefiting millions of people. The availability of isotopes from the reactors has given tremendous impetus to find new application in industry, in tracer technology and in medical sterilisation.

Bhabha's Day. The origin of India's nuclear power programme can be found in the speeches and writings of Homi Bhabha from around 1955 to the time of his untimely death in 1966.

The ideas of Bhabha got crystallised towards the late Fifties and early Sixties. In the Second Geneva Conference, he presented the conclusion that nuclear power was very important for the progress of the developing countries.

Two other ideas that have persisted in the formulation of India's nuclear power policy go back to Bhabha. The first one relates to the three stage fuel cycle strategy that he propounded very early on. The three stages are natural uranium, heavy water reactors in the first stage followed by fast reactors using plutonium from the first stage reactors and depleted uranium or thorium in the blanket and the third stage reactors employing the uranium 233—thorium cycle.

At the time Bhabha formulated this strategy, many aspects of the technology of fast breeder reactors, reprocessing and recycling of plutonium were only vaguely understood. Clearly this was very much a case of crystal gazing. It is remarkable that the basic elements of this strategy enunciated

Third World's First

Forty miles south of Madras, on the magnificent shores of the Coromandel Coast of the Bay of Bengal, visitors from all over the world come to admire the 12th-century old temples of the Pallava dynasty. Here amid the sand beaches and palm trees, eternal India can be found—its pilgrims, its stone sculptures, its fishermen clad in their clothes, and its inevitable beggars.

Nearby can also be found a large compound surrounded by barbed wire and guarded day and night. At this compound other Indians have built two large power reactors and the Third World's first fast breeder reactor. Nuclear scientists are busily planning to build 300 commercial fast breeders (500 Megawatts each) by the year 2050.

Of these two images of India, Westerners usually retain only the cliché image of a large undernourished country of 750 million. The fact is, however, that India is now more than self-sufficient in food production due to vast irrigation projects, a local fertilizer industry and locally built meteorological satellites.

And, in less than four decades, India has also managed to build the third strongest military force in the world. This India, propelled by a well-trained and ambitious body of technicians, businessmen and clerks—about 100 million people—firmly intends to establish the country as a major force in the region and the world.

Masters of the game. The key to fulfilling that ambition lies in a massive influx of high technology in both the civilian and military sectors. But in contrast to other Third World countries, India's policy of modernization has one paramount

objective: self-sufficiency through local manufacture.

The Indians are masters at playing one Camp against the other in order to extract the most advantageous deal. The list is impressive: Canadian- and French-designed nuclear reactors, Soviet T-55 tanks, Mig-21 and MiG-27 jets, Anglo-French Jaguar strike fighters, British frigates and many others.

India is already virtually self-sufficient in nuclear energy, but that was not achieved overnight, says Raja Ramanna, director of India's Atomic Energy Commission, "We did come close to collapse during the past 11 years, but we managed to survive." Today India builds its own power reactors, heavy-water and reprocessing plants and it plans to add 22 reactors within the next 15 years to the 6 already in operation.

India also boasts a rapidly growing space program presided over by Prime Minister Rajiv Gandhi himself. With a five-year budget of \$500 million and about 10 times as many employees as the 1,350-person European Space Agency, India's space effort strives for self-sufficiency in satellites and launch vehicles alike. Rather than continuing to rely on NASA, Ariane and Soviet launchers, India will use its own ASLV 68-pound payload launcher as early as next year before going to a larger Ariane-type PSLV in 1990.

Officially, the national launcher program is justified by reasons of economy. But Satish Dhawan, one of the fathers of India's space programme, does add with a smile: "Yes, PSLV could make an excellent ICBM, provided some small modifications are brought to its fourth stage."

(Pierre Lellouche in 'News week')

ated almost 30 years ago have remained essentially valid.

The roles of fast reactors, fuel reprocessing and recycling plutonium were recog-

nised very early on. Consequently these programmes were pursued vigorously even as the country was coming to grips with the real problems of the first phase of the nuclear

power programme.

Self-Reliance. The second idea that Bhabha injected into the programme was the need to develop self-reliant capability.

It was with this objective that manufacture of equipment for nuclear power plant within the country was taken up right from the early days of the programme. Even when General Electric Company of the U. S. was to supply the entire Tarapur Atomic Power Station on a turnkey type contract, it was obligated to get the control and instrumentation panels fabricated by the group concerned in Trombay. It was the same spirit that led to the decision to make in India half the initial charge of fuel (uranium dioxide pellets clad in zircalloy) even for the first heavy water reactor at Rajasthan.

Economic. Although the calculations revealed nuclear power to be economic in load centre locations (away from coal mines), there were many sceptics who did not believe these calculations. In fact when Jawaharlal Nehru was clearing the decision to go ahead with the first nuclear power plant, he asserted that while the economic calculations of Bhabha were impressive, they were only of secondary importance as the country had to go in for this new technology in its longterm interest. As it turned out, the Tarapur station has, over the last 16 years, supplied the lowest cost non-hydro electric power and has also created a sizable financial surplus.

This issue surfaced in a recent discussion regarding the economic viability of the sixth nuclear power station coming up at Kaiga in Karnataka. While the Madras Atomic Power Station is selling power at 42 paise per Kwh, the recently completed Raichur thermal station is expected sell power at 75 paise.

For 2000 AD. The target of 10,000 MW of nuclear power by 2000 AD calls for industrialising what up to now has been a prototypical activity. The wide ranging activities hitherto have created a sound base of trained manpower and good industrial potential. It will be necessary to devise appropriate managerial systems whereby large construction activities at a number of

sites can progress according to plans, manufacture of components at a number of shops can keep progressing without impediments and the engineering decisions required both for site work and manufacturing are made without delay.

In addition, the operating nuclear power plants should perform at high capacity factors and in a profitable manner, with proper control on operating expenses. There are other important matters of manpower training, industrial relations and public education. The Nuclear Power Board is gearing itself address these and other question and is confident of establishing a successful nuclear power industry in the country.

Future Programmes. Tarapur is one of the sites being considered for setting up a 500 MW atomic power station. The proposed nuclear unit likely to be commissioned by 1985, has made good progress.

The country had made substantial progress in designing and mechanised construction techniques for nuclear power station erection and soon it would be possible to build an atomic unit in seven years time, as against eight years at present.

The nuclear power units were "quite safe" for generation of large quantities of power and the government was encouraging manufacture of components and instruments for atomic stations. At least 90 per cent of the components at the Kalpakkam station near Madras were made indigenously.

Erection of two units of 235 MW each was on at Kaiga in Karwar region of Karnataka. Work on unclear units was also apace at Narora in Uttar Pradesh and Kakrapar in South Gujarat.

Once industrial capacity was built up for a programme of 10,000 MW, a stage of maturity would be reached which would permit a more rapid acceleration of nuclear power capacity.

For this, it was necessary not only to accelerate the present programme of building reactors based on heavy water and natural uranium, but also build fast breeder reactors and eventually utilise the "virtually inexhaustible" energy resource available in thorium.

Big leap. Estimates of the energy potential show that the uranium resources available in the country can support a programme of 350,000 MW when they are fully utilised by fast reactor and possibly a million MW when the country is able to exploit thorium.

The radiation risks from nuclear stations were less than those from many other normal activities according to the experts of Atomic Energy Commission. A nuclear power plant does not produce any significant quantity of radioactive waste. The technique available today is for this waste to be substantially reduced in volume and vitrified into a glass matrix of small volume.

The vitrified waste is encapsulated in stainless steel and buried underground for

long-term storage.

The quantity of waste from a 1,000 MW nuclear power station operated for one year is only three cubic metres, the experts say.

Atomic Commission. Following are the members of the Atomic Energy Commission: **Chairman:** Dr. Raja Ramanna, Secretary to Govt. of India, Department of Atomic Energy. **Members:** P. K. Kaul, Cabinet Secretary to Government of India., S. Venkataraman, Secretary to the Govt. of India, Ministry of Finance, Dr. P. K. Iyengar, Director, Bhabha Atomic Research Centre., Dr. M. R. Srinivasan, Chairman, Nuclear Power Board., N. Srinivasan, Chairman, Nuclear Fuel Complex & Chief Executive, Heavy Water Projects., J. R. D. Tata, Industrialist., Arvind Pande, Joint Secretary, Prime Minister's Secretariat is a permanent invitee.

110. DEFENCE

Since the days of border wars India has gone all out to build up her armed forces. Today India is having one of the largest military forces in the world with an army of nearly one million personnel. Indian Air Force is 1,13,000 strong and her Navy has 47,000 men.

The authority of the Supreme Commander of the Armed forces is vested in the President of India. Responsibility for national defence, however, rests with the cabinet. All important issues having a bearing on defence are decided by the Cabinet Committee on Political Affairs which is presided over by the Prime Minister. The Defence Minister is responsible to the Parliament for all matters concerning the Defence Services.

The direct responsibility for operational and administrative control of the Armed Forces is that of the Ministry of Defence and the three Armed Forces Headquarters of Army, Navy and Air Force. The Ministry of Defence acts as the central agency for controlling and coordinating the development of the three services, for conveying the policy decisions of the Government of India to the three Services Headquarters for implementation and for obtaining financial sanction from parliament for defence expenditure.

Ministry of Defence. The Ministry of Defence is headed by the Minister of

Defence who is of Cabinet rank. He is assisted either by Ministers of State for Defence or Deputy Defence Ministers. The Chief financial authority is the financial adviser to the Ministry of Defence. The Defence Ministry comprises four departments: (i) Department of Defence. (ii) Department of Defence Production. (iii) Department of Defence Supplies. (iv) Department of Defence Science and Research.

The Ministry is directly responsible for defence of India, provisioning and administration of the Armed Forces, viz. Army, Navy and Air Force, procurement of arms, weapons, ammunitions, ships, aircraft, vehicles, equipment and items of logistic support required by the Armed forces, the location and creation of indigenous capacity for production of hitherto imported items, and promotion of research and development in the field of defence.

Control of civilian services attached to the Ministry, formation of cantonments and delineation of their areas and regulation of housing accommodation for defence ser-

vices personnel are among the other responsibilities of the ministry.

The main auxiliaries are: (i) The territorial Army; (ii) Coast guards; (iii) Auxiliary Air Force; (iv) National Cadet Corps comprising wings of the Army, Navy and Air Force.

Huge Expenditure. Considering the size of the country, its very long borders and coastline, and also the strategic position it occupies in South Asia and the Indian Ocean, India has to maintain comparatively large defence forces. Today India is reported to have the fourth largest Army in the world, the fifth largest air force and the seventh largest navy. India's defence outlay has steadily increased from Rs. 806 crore in 1964-65 to nearly 8 times that figure (Rs. 6800 crore) today.

Chief of Staff. The Armed Forces consists of the three main services, The Army, the Navy and the Air Force, each of which is headed by their respective Chief of Staff viz., the Chief of the Army Staff, The Chief of Naval Staff and the Chief of Air Staff who are of the rank of General and equivalent. These three chiefs of staff constitute the chiefs of staff committee, the chairmanship of which rotates between the three service chiefs according to seniority. The Committee is assisted by sub-committees dealing with specific problems such as planning, training, communication, etc.

Army. The Army Headquarters are located in New Delhi. The Chief of the Army Staff is assisted by the following principal staff officers: (i) Vice Chief of Army Staff; (ii) Deputy Chief of Army Staff; (iii) Adjutant General; (iv) Quartermaster General; (v) Master-General of Ordnance; (vi) Military Secretary; (vii) Engineer-in-Chief.

The Army is organised into the following Commands: (i) Western; (ii) Eastern; (iii) Northern; (iv) Southern; (v) Central.

Each Command is commanded by a General Officer Commanding in Chief of the rank of Lieutenant General. The Command is further divided into Areas, Independent sub-Areas and Sub-areas, commanded by a Major General and Brigadiers respectively.

The Army consists of a number of arms and services. These are: (i) The President's Body Guard; (ii) Armoured Corps; (iii) Reg-

iment of Artillery; (iv) Corps of Engineers; (v) corps of Signals; (vi) Military Nursing Service; (vii) Army Medical Corps; (viii) Corps of Electrical and Mechanical Engineers; (ix) Remount & Veterinary Corps; (x) Military Farm Services; (xi) Army Education Corps; (xii) Intelligence Corps; (xiii) Corps of Military Police; (xiv) Army Physical Training Corps; (xv) Pioneer Corps; (xvi) Army Postal Service Corps; (xvii) Defence Security Corps.

Territorial Army. The Territorial Army is a voluntary part-time citizens' force consisting of persons who are not professional soldiers but civilians who are eager to play a role in the defence of the country. All Indian nationals between 18 and 35 years of age are eligible to join it. The T.A. comprises infantry, engineering and medical units.

National Cadet Corps. NCC is a youth organisation, open to students of academic institutions. It aims at development of leadership qualities, character and spirit of sportsmanship, cooperation and service. It is a voluntary organisation and neither officers nor cadets are under any obligation or compulsion to enter active military service.

NCC consists of 3 divisions, Senior, Junior and Girls with Army, Navy and Air Wings. The authorised strength of the senior division is 4 lakh, Junior Division 7 lakh and girls 62,000 among the three wings of the Armed Forces.

Navy. The Headquarters of the Navy is located in New Delhi. The Chief of Naval Staff is assisted by the following principal staff officers:

(i) Vice Chief of Naval Staff; (ii) Chief of Material; (iii) Deputy Chief of Naval Staff; (iv) Chief of Personnel; (v) Controller of Warship Production and Acquisition; (vi) Chief of Logistics.

The Navy has three Naval commands commanded by Flag Officers Commanding-in-Chief of the rank of Vice Admiral. They are: (i) Western Naval Command at Bombay; (ii) Eastern Naval Command at Vishakhapatnam; (iii) Southern Naval Command at Cochin.

There are two fleets, the Western and the Eastern, commanded by Flag Officers Commanding, of the rank of Vice-Rear Admiral.

Sub-Continental Military Balance★

	<i>Pakistan</i>	<i>India</i>	<i>Bangladesh</i>
ARMY	450,000	960,000	73,000
<i>Corps</i>	7	8	—
<i>Armoured Division</i>	2	2	—
<i>Mechanised Divisions</i>	—	1	—
<i>Infantry Divisions</i>	16	18	5
<i>Independent Armoured Brigades</i>	4	5	1
<i>Independent Infantry Brigades</i>	5	7	12
<i>Para Brigade</i>	—	1	—
<i>Independent Arty. Brigades</i>	7	17	2
<i>Mountain Divisions</i>	—	10	—
NAVY	11,000	47,000	5,300
<i>Submarines</i>	6	8	—
<i>Midget Submarine</i>	5	—	—
<i>Aircraft Carrier</i>	—	1	—
<i>Destroyers</i>	8	3	—
<i>Frigates</i>	—	21	3
<i>Corvettes</i>	—	3	—
<i>Missile Boats/FAC</i>	24	16	22
<i>Patrol Craft</i>	20	6	9
<i>Mine sweepers</i>	3	16	—
<i>Landing Ships</i>	—	6	—
<i>Fleet Tankers</i>	1	2	—
<i>Air Force</i>	17,600	113,000	3,000
<i>Combat Aircraft</i>	314	920	27
<i>Combat Squadrons</i>	18	39	3
<i>Transport Squadrons</i>	2	9	1
<i>Helicopter Squadrons</i>	2	14	1

★ 1984-85 figures based largely on materials from the International Institute of Strategic Studies, London.

There are also Flag Officers commanding Goa Area, Andaman & Nicobar Islands. In addition, there are Naval Officers-in-charge of Bombay, Madras, Calcutta.

The Fleets. The two fleets consist of the aircraft carrier INS Vikrant, a number of frigate squadrons comprising modern anti-aircraft, anti-submarine and general purpose ships, missile equipped frigates/destroyers, a squadron of anti-submarine patrol vessels, several mine sweeping squadrons, submarines, a submarine depot ship, a submarine rescue vessel, landing ships capable of carrying tanks and personnel, and several fast attack craft carrying surface-to-surface missiles. In addition there are survey ships, survey craft, fleet tankers and a number of

auxiliary craft such as tugs and mooring vessels. The survey units of the Navy carry out surveys of India's coast and surrounding waters, approaches to harbours, etc.

A naval organisation functions at Port Blair to ensure the security of the Bay Islands.

The Navy took over the responsibility of Maritime Reconnaissance from the IAF and has acquired suitable MR aircraft for the purpose.

The navy has a sizeable Air arm with various types of fixed wing aircraft and helicopters such as Super Constellation, IR-38, Alizes, Sea Harriers, Islanders, Sea Kings, Alstutter and KA-25. These are used in various roles such as maritime reconnaissance, anti-submarine work, search and res-

Commissioned Ranks

<i>Army</i>	<i>Navy</i>	<i>Air Force</i>
<i>Field Marshal</i>	<i>Admiral of the Fleet</i>	<i>Marshal of the Air Force</i>
<i>General</i>	<i>Admiral</i>	<i>Air Chief Marshal</i>
<i>Lieut. General</i>	<i>Vice Admiral</i>	<i>Air Marshal</i>
<i>Major General</i>	<i>Rear Admiral</i>	<i>Air Vice Marshal</i>
<i>Brigadier</i>	<i>Commodore</i>	<i>Air Commodore</i>
<i>Colonel</i>	<i>Captain</i>	<i>Group Captain</i>
<i>Lieut Colonel</i>	<i>Commander</i>	<i>Wing Commander</i>
<i>Major</i>	<i>Lieut. Commander</i>	<i>Squadron Leader</i>
<i>Captain</i>	<i>Lieutenant</i>	<i>Flight Lieutenant</i>
<i>Lieutenant</i>	<i>Sub. Lieutenant</i>	<i>Flying Officer</i>
<i>Second Lieutenant</i>	<i>Acting Sub. Lieutenant</i>	<i>Pilot Officer</i>

cue, logistic functions such as lifting troops and supplies, air interception, ground support and anti-shipping.

Building Gun Ships. Since 1964, India has developed considerably in building her own ships. At present a number of ships, submarines and smaller craft are under construction for the navy at yards such as Mazagaon Docks Ltd, at Bombay, Garden Reach Shipbuilders at Calcutta and Goa Shipyard.

Six Leander class frigates, INS Nilgiri, Himgiri, Udaygiri, Dunagiri, Taragiri, Vin-dhyagiri, one ship of indigenous design INS Godavari, two survey ships INS Sandlayak and Nirdeshak, seaward Defence boats, Harbour utility and ocean going tugs a mooring vessel and patrol craft have been built and commissioned.

The addition of three general purpose, missile carrying destroyers have added considerably to the operational efficiency of the Navy.

Coast Guard. The Coast Guard forms a part of the Defence Ministry. Its headquarters are at New Delhi and is headed by a Director General. It has three regional headquarters at Bombay (Western region), Madras (Southern region) and Port Blair (Andaman and Nicobar).

The main duties of the Coast Guard are protection of coastal and offshore installations and terminals, protection of fisheries, patrol

of the Exclusive Economic Zone to prevent poaching, anti-smuggling work, and search and rescue missions.

Although the Coast Guard initially comprised almost entirely of ships of the Navy and personnel on deputation, today the personnel of Coast Guard are mostly recruited directly and ships are built either in Indian shipbuilding yards or purchased from abroad.

The coast guard fleet comprises ships such as KUTHAR (ex-navy), VIKRAM, VIJAY, VEERA (indigenously built), a number of offshore patrol vessels and a number of inshore patrol vessels.

Air Force. The Air Force is organised into five operational Commands and two support Commands. These are:

(i) Western Air Command; (ii) Eastern Air Command; (iii) Southern Air Command; (iv) Central Air Command; (v) South Western Air Command; (vi) Training Command; (vii) Maintenance Command.

The Air Headquarters is located in New Delhi. The Chief of Air Staff is assisted by the following Principal Staff Officers:

(i) Vice Chief of Air Staff; (ii) Deputy Chief of Air Staff; (iii) Air Officer in Charge, Administration; (iv) Air Officer in Charge, Personnel; (v) Air Officer in Charge, Maintenance.

At the time of partition in 1947, India's share of the Air Force was less than 10 full

squadrons. Today there are more than 50 squadrons comprising combat, transport, liaison and reconnaissance aircraft/helicopters. There are more than 1000 aircraft and helicopters of which the main types are Camberra, Hunter, Ajeet, Kiran, Chetak, Mig-21/- 23/- 25, Sec-7, An-32, Il-76, Mi-8, Jaguar and Mirage-2000. In addition to purchases from abroad, India also designs and makes her own aircraft. The rapid development of the IAF has resulted in a well balanced force comprising modern aircraft with state-of-the-art equipment and all-weather capability. The IAF has a complete range of weaponry including infra-red and radar homing missiles which can be fired day or night with utmost accuracy.

Common Services. In matters like medical services, public relations, etc., which are common to all three services, they are served by *Inter-Service Organisations* which function directly under the Ministry of Defence. Some such important organisations are:

- (1) Armed Forces Film and Photo Division,
- (2) Armed Forces Medical Services, (3) Defence Lands and Cantonments, (4) Directorate of Public Relations, (5) Historical Section, (6) Joint Cipher Bureau, (7) Ministry of Defence Library, (8) National Defence College, (9) Services Sports Control Board, (10) Videshi Bhasha Vidyalaya.

Some of the noteworthy inter-service training establishments are: (1) Institute of Defence Management, (2) Institute of Armament Technology, (3) Defence Services Staff College, (4) National Defence Academy.

Armed Forces Medical Services: Comprise Army Medical Corps, Army Dental Corps and Military Nursing Service under the

overall control of Director General, Armed Forces Medical Services.

Armed Forces Medical College, Pune: Trains civilian candidates for the MBBS course of Pune University. 100 boys and 20 girls are admitted every year. Candidates who receive stipends number 60. Such candidates have to serve as Permanent Commissioned officers. Others may serve only 7 years. Post-graduate specialisation courses are also provided at Pune. Training in medical problems peculiar to aviators is given at the Institute of Aviation Medicine at Bangalore, and those peculiar to Navy such as those special to divers and submarines, at the Institute of Naval Medicine, Bombay.

Cantonments. These were established under the cantonments Act, 1924, with the purpose of accommodating Armed Forces personnel and safeguarding their health, welfare and security. Since the cantonments had a significant civilian population, it was found necessary to provide for local self-government of those areas.

The Cantonment Boards formed under the Cantonments Act 1924, look after the municipal administration in their areas under the central government. These boards are responsible for providing civil services to the community and for looking after their welfare. There are 62 cantonments in India.

Defence Production. The Defence production activities are broadly divided into two groups viz. departmentally run Ordnance Factories and Defence Public Sector undertakings, whereas the arms, ammunition, tanks, vehicles, etc. are made in the Ordnance Factories, the Defence public sector undertakings are geared to produce

Defence Production Results

(Rupees in Crore)

	1980-81	1981-82	1982-83
Value of Production	485.32	829.38	1028.23
Turnover	472.74	746.41	920.00
Profit before Tax	20.08	67.25	61.74
Return on turnover	4.25%	9.01%	6.71%

ships, submarines, aircraft, earthmoving equipment, machine tools, missiles, sensors, communication equipment, etc. The Ordnance Factories and Defence PSU's have an ongoing programme of indigenisation.

Public Sector Undertakings. There are presently 9 PSUs under the administrative control of the Ministry of Defence (Department of Defence Production). Out of them eight PSUs are in production making the aforementioned equipment. They are:

(1) Hindustan Aeronautics Ltd. (HAL), (2) Bharat Electronics Ltd. (BEL), (3) Bharat Earth Movers Ltd. (BEML), (4) Mazagaon Docks Ltd. (MDL), (5) Garden Reach Shipbuilders and Engineers Ltd. (GRSE), (6) Goa Shipyards Ltd. (GSL), (7) Praga Tools Ltd. (PTL), (8) Bharat Dynamics Ltd. (BDL).

The ninth PSU, Mishra Dhatu Nigam Ltd. (MDNL or "Midhani") manufactures the special alloys and metals required by aeronautics, space and electronics industries.

The nine Defence PSUs have a total work force of 97,522 out of which HAL has the maximum (40,470) and MDNL has the least (1070).

The working results for 1980-'81, '81-82 and estimates for 1982-83 are indicated below:

Research & Development. The R & D activities are carried out in 35 main laboratories/establishments and a few field units located in different parts of the country. The organisation is headed by the Director General, Research & Development (DGR & D) who is also the Secretary to the Govt. for Defence Research. He is assisted by three chief controllers.

111. INDUSTRIAL STRIDES

India is an industrial giant among the developing countries. With an ever growing internal market of 750 million people, her industrial products have reached markets across the seven seas. It has also developed a technology appropriate for the needs of the third world.

However, all is not well with the Indian industries. While the performance of India's private industrial sector has been exemplary, the vast array of public sector enterprises have been grossing up losses of billions of rupees over the years. Of late, the ideological dogmatism seems to have given way to pragmatism. It is too early to judge the outcome.

Mixed Economy. In the first flush of independence, India opted for a mixed economy. The industrial policy announced on 6th April 1948 envisaged an economy where public and private enterprises co-operated. The public sector reserved to itself monopoly rights in certain departments of industry like arms, atomic power, railway, transport, etc. Other fields were left open for the private sector.

The Industries (Development and Regulation) Act, 1951 made it obligatory for all new and existing industries and any substantial expansion and manufacture of new products by existing concerns to be licensed under the Act.

Industries (Development and Regulation) Amendment Act, 1984. The Industries (Development and Regulation) Act, 1951 has been amended to confer specific powers on the Central Government to define "Small Scale Undertakings" and "Small Scale Ancillary Undertakings" and on the advice of a high level committee, to reserve specific items for exclusive production in such undertakings.

Socialist Pattern. In 1956 when the Congress Party decided to establish a socialistic pattern of society in India, the 1948 resolution was revised and a new policy was announced on April 30, 1956. Under this policy, industries were divided into two groups—Schedule A and Schedule B. The industries in Schedule A would be entirely state-owned; those in Schedule B would progressively become state-owned. Non-scheduled industries were left to the Private Sector, but public enterprises were free to enter this sector, if and when the Government so chose.

In 1970 the whole gamut of industrial policy

was overhauled. The licensing policy was drastically revised in July 1970. The object of the revision was to give effect to the recommendations of the Industrial Licensing Policy Inquiry Committee (The Dutt Committee) and the Monopolies Inquiry Commission. The new licensing policy sought "to assign definite roles and areas of operation to different categories of entrepreneurs."

Industrial production was divided into the *core sector* (basic and strategic industries), the *middle sector* and *delicensed sector*. The middle sector was divided into two categories, the *heavy investment sector* (with a capital of 5 crore or more) and the *light investment sector* (capital between one crore and 5 crore). All industries requiring less than one crore investment were classified as delicensed.

The revised policy also introduced the concept of a *joint sector* in industry in accordance with the recommendations of the Dutt Committee.

The Monopolies & Restrictive Trade Practices Act, 1969 was brought into force in June, 1970. The Act placed a number of restrictions on big units with a total capital of 20 crore or over, in regard to appointments of directors, expansion of business and amalgamations or mergers.

Janata Policy. The Industrial Policy of the Janata government was to be based on the agricultural economy. "The prosperity and the distribution of income arising from a broad-based growth of agriculture and related activities in the countryside have to provide the basic demand for a wide range of industries producing articles of consumption."

"It is only by such a process of reinforcing interaction of the agricultural and industrial sectors that employment can be found for the large numbers of the rural population who cannot be absorbed in the agricultural sector, the party declared."

Liberalisation. 1984-85 saw a number of steps by Government to liberalise industrial policy and streamline investment procedures. Within the overall framework of the Industrial Policy Resolution of 1956, a growth-oriented approach continued to be the basic thrust of the industrial policy.

Shopfloor Ethos Outdated

"Our ethos on the shop floor is not one which belongs to the twentieth century"—these words by Prime Minister Rajiv Gandhi seems to be a sad commentary on the industrial and scientific fields in the present-day India.

Speaking at Kalpakkam where he dedicated the atomic power reactors to the nation on Dec. 16, 1985, Rajiv Gandhi said:

"Our usage of science and technology has given us great dividends, no doubt, but certain anomalies persist. Sometimes I feel our management systems are outmoded, our work ethics, whether in the private or public sector, is outdated.

"We have come a long way from the Rajasthan Atomic Power Station (estd. in 1973) to the Madras Atomic Power Station, but sometimes get the feeling that our foot has got behind.

"Outages, slow rectification of faults, inefficient management systems, lack of standardisation and delays were problems to be tackled."

(Hindu: December 17, 1985)

All these measures were tuned towards the removal of constraints on production and enhancing the level of capacity utilisation, as well as raising productivity and imparting maximum speed to the process of growth in the industrial economy.

Industries (Development and Regulation) Act, 1951 continues to provide the necessary regulatory framework to ensure healthy and accelerated growth of the various constituents of the industrial sector. With a view to removing certain doubts about the power of the Central Government to reserve specific items for exclusive manufacture by small scale industries, the Act has been amended to empower the Central Government to reserve, on the advice of an Advisory Committee, items for small scale sector.

Targets of Production for Selected Industries for 1989-90

Industry	A/C. Unit	Production 1984-85 (Likely)	Target 1989-90	Targetted growth per annum during VIIth Plan	
1	2	3	4	5	6
1. Commercial Vehicles	1000 Nos.	106	195	13%	
2. Tractors	1000 Nos.	85	135	10%	
3. Two-wheelers	1000 Nos.	937	1850	15%	
4. Cement Machinery	Rs. crore	60	120	15%	
5. Mining Machinery	Rs. crore	55	100	13%	
6. Chemical, Petro-chemical & Pharmaceutical Machinery	Rs. crore	170	300	13%	
7. Machine Tools	Rs. crore	315	765	20%	
8. Steel Castings	1000 Tonnes	88	129	8%	
9. Steel Forgings	1000 Tonnes	156	250	10%	
10. Textile Machinery	Rs. crore	500	805.3	10%	
11. Railway Wagons	1000 Nos.	12	30.8	21%	
12. Cranes	1000 Tonnes	26	47.75	12%	
13. Material Handling Equipment	Rs. crore	103	208	15%	
14. Electrical Power Equipment:					
(a) Thermal Sets	MW	2755	3725	7%	
(b) Hydro Sets	MW	399	1450	29%	
(c) Power Transformers	Million KVA	25.0	23.6	—	
15. Metallurgical Machinery	Rs. crore	65	90	7%	
16. Passenger Vehicles	1000 Nos.	78	140	13%	

Broad-banding. With a view to providing flexibility to the manufacturers to adjust their product-mix according to the market demand and with a view to encouraging larger volume of production so as to secure the benefits of economies of scale, broad categorisation of all types of two-wheelers and four-wheeled vehicles as well as paper and paper board has been brought about.

In order to ensure more expeditious disposal of licensing applications from MRTP companies, it has been decided to consider such applications simultaneously under the Industries (Development and Regulation) Act and the Monopolies and Restrictive Trade Practices Act. The objective stands further facilitated by combining the Department of Company Affairs with the Ministry of Industry.

The scheme for re-endorsement of capacity on the basis of the best production during the previous five years, extended during 1983-84, has been further extended to allow

the benefit of increased production during 1984-85.

Self-employment. A scheme for self-employment for the educated unemployed youth, launched in August, 1983 continued during 1984-85.

The General Index of Industrial Production registered a higher growth rate of 6.6% during April-November, 1984 compared to 4.4% growth achieved during April-November 1983.

The overall index which had been exhibiting a continuous rise from 164.6 in 1981 to 172.0 in 1982 and 179.7 in 1983, stood at the level of 190.1 in January-November, 1984. In fact, the index for each individual month of the period January-November, 1984 stood at a level higher than that of the corresponding months of 1983.

Growth Rate. The composite index of six infrastructure industries, viz., electricity, coal, saleable steel, petroleum refinery products, crude petroleum and cement together

accounting for a weight of 23.3% in the General Index, recorded a rise of 10.2% during April-January, 1984-85. This is a distinct improvement over the growth rate of 6.2% recorded by these industries during April-January, 1983-84.

An analysis of growth of 18 major industry groups in the manufacturing sector has shown that 11 groups with a weight of 65.4% registered a positive rate of growth during April-October, 1984 over April-October 1983. Further, analysis of provisional production data for 150 selected industries with a weight of 83.3% in the index indicates that 109 industries recorded a positive growth. Of these 66 industries registered a growth of more than 10% and 24 industries a growth of over 25%.

Despite the increase in threshold for industrial licensing from Rs. 3 crore to Rs. 5 crore, the number of Letters of Intent increased from 1055 in 1983 to 1064 in 1984. The total value of capital goods cleared for import (by the main Capital Goods Committee) amounted to Rs. 713.47 crores in 1984 as against Rs. 606.95 crores in 1983, registering an increase of 17.6 per cent.

Public Sector undertakings achieved a growth of 21% by recording a turnover of Rs. 1651 crore in the period April-December 1984. This is over and above the compound growth rate of 21% achieved in the previous three years. After achieving an aggregate profit of Rs. 14 crore and Rs. 28 crore in 1982-83 and 1983-84 respectively, the expected profit in 1984-85 is placed at Rs. 27 crore.

While BHEL, HMT, BHPV and Lagan Jute are already making profits, from amongst the undertakings which were earlier continuously incurring losses a number of units turned the corner in 1983-84. These are Bharat Pumps and Compressors Ltd., Burn Standard Company Ltd. and Bharat Wagon & Engineering Co. Ltd. Maruti Udyog Limited, recorded profit in 1983-84, the very first year of its operation. Some more units, are likely to break even during 1984-85.

The Seventh Plan outlay for Public Sector Industries is Rs. 6,80,000 crore. It is the highest ever provided for state sector. "This huge investment will help bring about the desired goal of socialist society which would

Growth Rate Up

The growth rate of industrial production during the first half of 1985-86 was 6.1 per cent.

There was a 47.5 per cent growth in April-September 1985 over the corresponding period in the previous year in the grant of letters of intent. In the case of industrial licences, it was 17.2 per cent.

There was a 31 per cent increase during April-September, in foreign collaboration deals approved by the Government. A marked acceleration in the assistance provided by financial institutions in 1984-85 was noted. While assistance sanctioned increased by 38.5 per cent, disbursement went up by 17.6 per cent. The approvals for raising capital by non-government companies rose by 25 per cent during April-June.

The share of the backward areas in the letters of intent had increased from 9.6 per cent in 1970 to 52.1 per cent during January to September 1985.

Under the self-employment scheme, 8.94 lakh applications were received, 3.68 lakh recommended and 2.26 lakh, involving a credit of Rs. 389.71 crore, sanctioned till March '85. These figures represented 90.4 per cent fulfilment of the target.

As regards the automobile industry along with expansion, attention was being given to technological upgradation through indigenous R and D as well as selective imports of knowhow.

provide equality of opportunity to all and ensure removal of disparity", hoped Prime Minister, Rajiv Gandhi in Lok Sabha while taking part in Plan discussions.

Industrial Licences. 1064 Letters of Intent and 905 Industrial Licences were issued during the year 1984.

Details of Letters of Intent (LI)/Industrial Licences (ILs) issued during the years 1980

to 1984 and the share of backward districts therein are given below:-

Letters of Intent Industrial Licences				
Year	Total	Share of Backward Districts	Total	Share of Backward Districts
1980	946	415	475	147
1981	916	372	476	165
1982	1043	601	432	145
1983	1055	663	1075	317
1984	1064	627	905	323

The main areas of Foreign Collaboration approval during 1984 were as follows:-

Industry	No. of Approvals
(1) Electrical Equipment	... 157
(2) Industrial Machinery	... 138
(3) Chemicals (other than fertilizers)	... 69
(4) Ceramics	... 15
(5) Industrial Instruments	... 56
(6) Machine Tools	... 34
(7) Metallurgical Industries	... 26
(8) Other Industries	... 257
Total	752*

* These figures include composite cases as well as proposals considered by Export-oriented Board, the Administrative Ministries under the delegated powers and Kandla Free Trade Zone Committee, Santacruz Electronics Exports Processing Zone.

The Country-wise distribution of Foreign Investment Approvals during 1984 is as follows:-

Country	Quantum of Investment (Rs. in lakh)
1. Austria	0.40
2. Bahrain	6480.00
3. Belgium	46.70
4. Bulgaria	12.00
5. Canada	35.00
6. Denmark	25.00
7. Finland	21.00
8. F.R.G.	284.49
9. France	121.80
10. Hongkong	20.00
11. Hungary	29.98
12. Italy	77.00
13. Japan	615.22
14. Kuwait	28.16

15. Singapore	24.60
16. Sweden	142.25
17. Switzerland	44.00
18. Taiwan	2.40
19. United Arab Emirates	750.00
20. USA	894.97
21. UK	181.26
22. Non-Resident Indians	1463.99
Total	11300.22

Private Sector. Business houses engaged in industry, trade or other activities fall into four groups according to their legal status. 1. Joint-stock companies, 2. Partnership 3. Co-operatives and 4. Statutory organisations. Joint-stock companies are companies with limited liability which are registered under the Indian Companies Act and are governed by it. Partnerships are firms with unlimited liabilities and are regulated by the Partnership Act.

Co-operatives function under the Co-operative Society Acts. Statutory organisations are governed by the specific Acts under which they are formed. The nationalised banks, for example, are now statutory organisation governed by The Banking Companies (Acquisition and Transfer of Undertaking) Act 1970. Before nationalisation, they were joint-stock banks and bore the suffix 'limited'. This suffix has disappeared with nationalisation because they are no longer governed by the Indian Companies Act.

Of the four groups mentioned above, joint-stock companies form by far the largest group. This group is collectively called the **Corporate sector** because all of them are companies incorporated under the Companies Act. The corporate sector covers both private and public sectors. That is to say, it contains all the joint-stock companies in the private sector and such public sector companies as are incorporated under companies Act. As between public and private sector companies, the main difference is that the public sector companies are, as a rule, gigantic while private sector companies are puny in size, though much greater in numbers.

The Companies Act. The Indian Companies Act 1913, a piece of pre-war legislation, was thoroughly overhauled after independence and replaced by the Com-

Tata-Birla Race

TheTatas and the Birlas are engaged in a neck and neck race for supremacy among the 25 large industrial houses in India.

The Tatas' turnover in 1983 stood at Rs. 3,069.38 crore as against Rs. 2,765.05 crore of the Birlas'. But, the Birlas had an edge over the Tatas in the matter of assets. They stood at Rs. 2,830.94 crore in 1983 as against the Tatas' Rs. 2,672.40 crore.

The two industrial houses have maintained a steady increase in their assets and turnover in four years between 1980 and 1983.

The assets of the Birlas stood at Rs. 1,431.99 crore in 1980, Rs. 1,691.69 crore in 1981, Rs. 2,004.74 crore in 1982 and Rs. 2,839.94 crore in 1983 and the turnover Rs. 1,845.20 crore, Rs. 2,161.55 crore, Rs. 2,378.99 crore and Rs. 2,765.04 crore respectively.

The figures for Tatas were as follows: Assets Rs. 1,538.97 crore in 1980, Rs. 1,840.16 crore in 1981, Rs. 2,430.83 crore in 1982 and Rs. 2,672.40 crore in 1983, and the turnover Rs. 1,942.90 crore, Rs. 2,389.77 crore, Rs. 2,883.15 crore and Rs. 3,069.38 crore respectively.

Here is a list of the top 20 industrial houses.

(Rs. in crore)

Industrial House	Assets 1983	Turnover 1983
1. Birla	2830.94	2765.04
2. Tata	2672.40	3069.38
3. Mafatlal	694.95	982.92
4. J.K. Singhania	674.15	651.04
5. Thapar	572.18	753.08
6. A.C.C.	571.36	571.31
7. Reliance Textiles	562.98	621.51
8. Sarabhai	444.61	510.03
9. Larsen & Toubro	423.71	392.14
10. Modi	410.50	686.52
11. Bajaj	383.99	482.92
12. Walchand	383.63	489.30
13. I.C.I.	375.42	560.15
14. Kirloskar	362.46	490.34
15. T.V.S.	357.22	443.85
16. Shri Ram	356.93	700.71
17. I.T.C.	355.71	791.54
18. Bangur	350.39	498.37
19. Hindustan Lever	303.8	707.6
20. Mahindra & Mahindra	292.19	417.38
Total:	13379.61	16585.49

Source: Parliament Question-Answers.

panies Act 1956. There have been 14 amendments since. These amendments have altered the very face of the Act.

One of the most important amendments was the Companies (Amendment) Act 1969. It abolished the system of Managing Agency/ Secretary and Treasurer with effect from April 3, 1970. The amendment also prohibited corporate companies from making donations to political parties.

The next important amendment was the Companies (Amendment) Act 1972. This brought in many changes of a drastic nature. One crucial amendment classifies companies

with a paid up capital of Rs. 25 lakh or more or with a turnover of Rs. 50 lakh and above as public companies.

Once such companies are declared public companies they cannot borrow or invest or appoint a managing director or full-time director or a selling or purchasing agent or any person holding a salary of more than Rs. 3000 without the permission of the Central Government.

Under another amendment (Section 408) the Central Government has reserved to itself the right to appoint any number of directors to the Board which means that the

shareholders have no powers left to elect their own directors and run their business.

Company Law Board. This Board was constituted under Section 10 E of the Companies Act 1956. The Central Government has delegated its powers and functions under S. 294 AA to the Company Law Board by a Notification d. 24th June, 1975. Now that the powers of the Govt, under Ss. 2 (18 A), 17, 18, 19, 79, 141 and 186 of the Companies Act have been statutorily vested in the Board, it has acquired complete authority and jurisdiction over all private sector companies. The fact that the Secretary to the Dept. of Company Affairs is also the Chairman of the Board makes it a full-fledged Dept. of the Government of India.

As most of public sector companies and all of the private sector companies are registered under the Companies Act, they are quite similar in structure and working. One point of difference may, however, be noticed. While public sector companies suffer little or no casualties, private sector companies show a very high rate of mortality.

Companies At Work. As on 31st December, 1984, 1,03,694 companies limited by shares with an aggregate paid-up capital of Rs. 23,150.2 crore were at work in the various States and Union Territories. These companies comprised 985 Government companies and 1,02,709 non-Government companies with a paid-up Capital of Rs. 17,368.6 crore and Rs. 5,781.6 crore respectively.

In addition to the companies limited by shares there were 1,643 companies limited by guarantee at work in the country as on the 31st December, 1984.

There were also 291 companies with unlimited liability at work in the country as on 31st December, 1984. All these companies were non-Government private companies.

Of these 291 companies, 75 were registered in the State of Gujarat, 147 in the State of Maharashtra, 2 in the State of Rajasthan, 26 in the Union Territory of Delhi, 35 in the Union Territory of Goa, Daman & Diu, 2 in the State of Punjab, 3 in the State of Karnataka and one in the State of West Bengal.

New Registration. During the year 1983-84, 11,619 new companies limited by shares having an authorised capital of Rs. 1433.1 crore were registered under the Companies Act, 1956. Of these 32 were Government companies and 11,587 were non-Government companies with authorised capital of Rs. 200.3 crore and Rs. 1232.8 crore respectively. 30 non-Government companies with unlimited liability and 66 non-Government companies with liability limited by guarantee were also registered during the year.

During the first 9 months of 1984-85 (April to December, 1984), 9,615 new companies limited by shares with an authorised capital of Rs. 1,593.3 crore were registered under the Companies Act, 1956. During the corresponding period of the previous year the number of such registrations was 8,441 and their authorised capital amounted to Rs. 1,079.9 crore.

During the year 1983-84, 258 companies limited by shares reported to have ceased to work either by going into liquidation or by being struck off under section 560 (S) of the Companies Act, 1956.

Companies at work as on 31-12-1984

	Government Companies		Non-Government Companies	
	No. of Companies	Paid-up Capital Rs. in crore	No. of Companies	Paid-up Capital Rs. in crore
1	2	3	4	5
Public Limited companies	430	1,530.7	13,608	4,243.4
Private Limited Companies	555	15,837.9	89,101	1,538.2
Total	985	17,368.6	1,02,709	5,781.6

Foreign Companies. As on 31-3-1984, 326 foreign companies as defined under Section 591 of the Companies Act, 1986 were at work in the country. During the period April to December, 1984, 8 foreign companies established their place of business in India while 2 companies closed down their branches. Thus, the total number of foreign companies at work as on 31st December, 1984, was 332. The number of foreign companies at work as at the end of each of the preceding five financial years is shown in Table below.

**Number of Foreign
Companies at work**

As on	No. of foreign Companies
31-3-1980	315
31-3-1981	300
31-3-1982	311
31-3-1983	320
31-3-1984	326
31-12-1984	332

Small Scale Sector. The small scale sector comprises a wide range of small and medium industries.

Small industries are identified by different criteria in different countries. In India small industries were originally defined as industrial units with a capital of not more than Rs. 5 lakh, irrespective of the number of persons employed. In 1975-76 the maximum capital capacity of a *small industry* was raised to Rs. 10 lakh and in the case of *ancillaries* to Rs. 15 lakh. In 1980, it was further raised to

Rs. 20 lakh for small units and Rs. 25 lakh for ancillaries.

In 1977 the Janata government carved out a new sub-sector in small scale industries called the *Tiny Sector*. This sector covered the smallest of the small industries, otherwise known as cottage industries. The maximum investment in this sector is Rs. 2 lakh.

Small industries have a favoured status in the national economy. They can produce any type of goods, however sophisticated, within their capital capacity. Certain items have been set apart for the small scale sector and large units have been specifically barred from producing those goods.

The number of such reserved items have steadily increased, bringing them up to 807 in 1978. In 1983-84 it stood at 872.

The items on the renewed list would be changed according to the exigencies of production. In 1982 they numbered 837.

Growth. The growth of small industries in India during the plan periods has been described as "nothing short of a revolution".

The small scale sector, which started with the manufacture of simple items like buckets, trunks, rails, agricultural implements, etc, with the help of simple hand tools, has now entered many sophisticated fields like electronics, plastics, chemicals, precision instruments etc.

In regard to khadi and village industries, production in 1982-83 was expected at Rs. 764 crore, an increase of about 15% over the previous year. It is likely to go up to Rs. 862.93 crore during 1983-84. Similarly, during 1982-83 employment was provided to

Small Scale Sector

Item	1982-83	1983-84	%age Growth 1983-84 1982-83
(1) Value of production (Rs. in crore at 1979-80 prices)	27,700	30,415	(+) 9.8
(2) Employment generated (lakh persons)	79.00	84.15	(+) 6.5
(3) Value of exports (Rs. in crore)	2,100	2,350	(+) 11.9

34.34 lakh persons, an increase of about 6% over the previous year, and is expected to further increase to 36.85 lakh persons during 1983-84.

District Centre. In pursuance of the statement on industrial policy announced in the Parliament in July, 1980, certain modifications have been carried out in order to restructure the District Industries Centres. The restructured DIC would have, besides one General Manager and four Functional Managers, upto three Project Managers in technical disciplines considered relevant to development of projects.

The present pattern of sharing the expenditure on the DICs between the Centre and the States on 50:50 basis would continue.

For the Sixth Plan period, small scale is expected to show a compound growth rate of 8.7% in production, 5.8% in employment and 12% in exports.

Industrial co-operatives have been assigned an important place in the scheme of economic development. The industrial policy of the Government also lays special emphasis on the development of village and small industries in order to generate more employment opportunities in the rural areas. Industrial co-operatives are expected to play an important role in the successful implementation of the policy.

National Federation of industrial co-operatives was set up to assist in marketing of products of Member Societies both within and outside the country. The Federation continued to provide promotional and marketing assistance to Industrial Co-operatives and enlarge its coverage to involve more societies.

At the end of October, 1982, it had 74 members and its paid up share capital was Rs. 31.11 lakh. As against export of Rs. 287.82 lakh in the year 1980-81, it executed export order worth Rs. 315.40 lakh during the year 1981-82. In so far as internal marketing is concerned it has completed business of Rs. 69.77 lakh in 1981-82.

Handloom weaving is one of those traditional village industries that have held their own against modern mechanised industries.

Black Money 31000 crore!

The size of the black economy in India is staggering. According to the latest study by the National Institute of Public Finance and Policy published in July 1985, black incomes in 1983-84 accounted for 18 to 21 per cent of GNP and amounted to between Rs. 31,000 crore and Rs. 37,000 crore.

There are a number of other interesting findings in the report. Here are a few:

- *Income on which tax was evaded in 1980-81 was at least 68 per cent of the income actually assessed for tax, and may have been as high as 139 per cent.*
- *The rate of tax evasion in the sugar industry doubled from the 1960s to the 1970s.*
- *In Madras alone, the black incomes generated from real estate may have been as high as Rs. 677 crore in one year.*
- *The average executive engineer working on irrigation canals in a southern state made black income of Rs. 2.6 lakh a year, when his official salary including allowances was Rs. 28,500 only.*
- *Unaccounted leakages from government expenditure during 1980-81 are estimated at Rs. 1,636 crore.*

According to S. Banerjee* handlooms provide direct employment to more than a crore of people and indirect employment to another half a crore. Completely neglected under the British raj, this long established village industry was paid special attention to by independent India. As a first step towards the regeneration of the industry, the *All India Handloom Board* was formed in 1952.

Since co-op. societies enjoyed certain privileges most handloom units were converted into co-op. societies, who thus enjoyed facilities of co-op. finance and marketing. In addition, 18 textile items were set apart for the handloom weavers and mills in the organised sector were barred from

* President, All India Handloom Fabrics Marketing Co-op. Society.

producing such varieties.

Handloom is a cottage industry in every sense of the term as the work is done largely in the home of the weaver himself. There are over 3.5 million handlooms in the country providing direct employment to nearly 10 million people.

The handloom sector produced over 3,100 million metres of cotton textiles during 1980-81. This is more than 30 percent of the cotton textiles produced in the country. A rough estimate indicates that the production in 1981-82 was more than 3,700 million metres.

Handicrafts. Handicrafts industry in India, besides helping to solve both social and economic problems of the village craftsmen and the vulnerable sections of the society, has come to play an important role in earning valuable foreign exchange for the country. During 1979-80 handicrafts ranked as the third largest foreign exchange earner after agriculture and allied products and textiles. Exports registered more than a ten-fold increase during the last ten years from Rs. 80 crore in 1970-71 to Rs. 854 crore in 1979-80.

The industry is highly labour-oriented and currently provides employment to about two million craftsmen and their dependents numbering another five million. Dispersed all over the country, the industry is traditionally confined to the decentralised sector. Uttar Pradesh accounts for more than 60 per cent of India's production and exports of the major handicrafts (excluding gems & jewellery) namely handknitted woollen carpets, art-metalwares, hand-printed textiles and wood wares.

Khadi & Village Industries Commission is one of the main instruments for rural

industrialization. Set up under an Act of Parliament in the year 1957, it is responsible for planning, organizing and implementing programmes for the development of khadi and 25 specified village industries.

Its programmes are implemented through 25 State Khadi and Village Industries Boards about 800 registered institutions and 29,000 co-operatives. The activities of the Commission, at the moment, cover about a lakh of villages in the country.

Khadi and Village Industries have shown significant progress during the year 1984-85. The overall production in Khadi and Village Industries for the year 1984-85 is estimated at Rs. 1,000.00 crore compared with Rs. 874.92 crore during the year 1983-84, registering a growth of about 14.29 per cent. This sector is expected to provide employment to 39.36 lakh persons during the year 1984-85 as compared to 35.50 lakh persons during the year 1983-84, registering a growth of 10.87 per cent.

Coir Board, a statutory body established by the Central Government, continued its activities of promotion and development of the coir industry during the year under review. It undertook the export of coir and coir goods, research for product betterment, modernisation of manufacturing techniques, fixing grade and standards and arranging inspection of coir goods and generally improving their marketing both within and outside the country.

With a view to assisting the State Governments in their efforts to encourage co-operatives in the coir industry, Government have drawn up a scheme for the co-operativisation of the coir industry, which aims at the formation of viable co-operatives

112. SECOND GREEN REVOLUTION

India's agricultural growth from the days of the begging bowl to the days of philanthropy has been phenomenal. The Green Revolution brought about by scientific methods of cultivation helped her not only to brave the ravages of flood and draught but also to offer food aid to the less fortunate masses in Asia and Africa.

Food has always been a critical element in the Indian economy, mainly because droughts and floods have been ravaging the

country from time to time. Indian agriculture banks heavily on rainfall. In a country so dependent on rainfall for its food, famines

pose a perpetual threat.

We have no record of the extent of devastation caused by famines, before the British rule. It was the British administration that first started assessing the casualties and damages caused by famines in India and worked out policies to keep them in check. During the British rule, local famines in scattered areas were quite frequent. Now and then some of these famines turned calamitous and shook the country throughout its length and breadth.

The primary cause of famines is obvious—drought or the failure of rains during critical crop seasons. No commission was necessary to find it out. The problem was how to contain drought and consequent shortage of food supply.

Free India inherited this problem on a magnified scale. With the partition, India lost some of the vital centres of food production like Sind and East Bengal to Pakistan. So while India got 82 per cent of the total population of undivided India, it got only 75 per cent of the total cereal production, 65 per cent of wheat production and 68 per cent of the rice production. Thus the imbalance between population and food production was worsened.

Food grains production during 1983-84 pierced the barrier of 130-133 million tonnes in the last four years and reached an all-time peak of 151.54 million tonnes, marking an increase of about 22 million tonnes or 17 per cent over the production level of the previous year.

The production of rice touched the all-time peak level of 59.77 million tonnes, marking an increase of 12.65 million tonnes over the level reached in 1982-83 and of 6 million tonnes

over the previous record level of 53.77 million tonnes reached in 1978-79. The production of wheat has maintained a sustained growth.

In fact, for the past four years, each year has been a year of record production. In 1983-84, wheat production was of the order of 45.15 million tonnes, marking an increase of 2.36 million tonnes over the previous peak level reached in 1982-83. The production of other cereals, taken together, at 33.97 million tonnes is the highest so far as against 27.75 million tonnes in 1982-83, and the previous record level of 31.09 million tonnes reached in 1981-82.

The table below gives the production of foodgrains during the last five years:

Record Production. The record foodgrain production of 151.5 million tonnes during 1983-84 was a signal achievement for India, receiving world-wide acclaim. What is particularly notable is that while the first *Green Revolution* of 1967-68 arose from introduction of new high yielding varieties of Mexican wheat and dwarf rice varieties evolved by the International Rice Research Institute, the spectacular increase in production during 1983-84 was mainly owing to organised input management.

The year 1983-84 could thus be termed as the *Second Green Revolution* showing a massive increase in production through expansion in supplies of inputs and services to the farmers, extension and better management. As compared to the previous years, the increase in 1983-84 in the distribution of seed, fertiliser and pesticides showed a marked increase. The expansion in the provision of institutional credit for agriculture was also encouraging.

Production of Foodgrains

(Million tonnes)

Year	Rice	Wheat	Other Cereals	Total Cereals	Total Foodgrains
1979-80	42.33	31.83	26.97	101.13	109.70
1980-81	53.63	36.31	29.02	118.96	129.59
1981-82	53.25	37.45	31.09	121.79	133.30
1982-83	47.12	42.79	27.75	117.66	129.52
1983-84	59.77	45.15	33.97	138.89	151.54
(Provisional)					

The highly notable and encouraging feature of this second Green Revolution is that whereas the first Green Revolution of 1967-68 was confined mainly to a few progressive areas of Punjab, Haryana and West U.P., the second Green Revolution of 1983-84 has witnessed tremendous progress in Eastern and Central States including West Bengal, Bihar, Orissa, Madhya Pradesh and U.P. where the growth rates had been relatively slow.

The overall growth in agricultural production had a very salutary effect on the economy. Supplies of rice, wheat and other cereals have been in abundance and the prices have been ruling mostly at a lower level than last year. Procurement of rice and wheat touched a new peak and the stocks of foodgrains also reached a record level.

Tempo Maintained. During 1984-85, the tempo of agricultural development was maintained despite lack of rains in some rainfed areas. Although the onset of south-west monsoon was generally in time, the precipitation was uneven and erratic in many areas, and parts of West Bengal, Bihar and Orissa were affected by excessive rains during the last week of June, 1984. In Punjab, Haryana and Uttar Pradesh, the monsoon was erratic and insufficient since May-July.

The situation further worsened due to power shortage and breach in Bhakra Main Line Canal. Moisture stress, which delayed paddy transplantation in some States, also affected groundnut crop in Saurashtra. Widespread rains in the second half of August, however, made up the deficiency to a considerable extent.

The overall post-monsoon deficiency in rainfall during the period October-December, 1984 has been termed as the worst since 1980. Twentythree Sub-Divisions had deficient rainfall during the post-monsoon period. This deficiency caused considerable precipitation stress in the major rabi growing States of Haryana, Punjab, U.P., Rajasthan, Gujarat and Bihar plains. However, about 70% of the wheat crops were being sown in the areas with irrigation facilities, and thus there was not much damage to the wheat crop. In the country as a whole, the prospects of rabi harvests were quite encouraging.

New Rubber Tree

A handful of seeds of a shrublike plant brought to Gujarat from Mexico five years ago has thrown up the possibility of producing natural rubber on a large scale.

The seeds of Guayule plant, which yields rubber resin and hard wax, were brought by a Gujarati rubber Technologist, from Mexico in 1980. He offered these to the Gujarat Government to set up a nursery here. Within five years, some 3,300 plants have grown up at the nursery.

The technologist, Dr. Suresh Patel, who owns a rubber factory and is associated with a private research and development centre, has successfully extracted and processed good quality rubber from the plant with which he has manufactured washers tubes and tyres.

Since the plant grows in arid zones, not requiring much water and other inputs like fertiliser, the State Government visualised the possibility of growing them on the wasteland. The Forest Department has already grown these on an experimental basis on 15 plots in Kutch, Banaskantha, Sabarkantha, Mehsana and Bhavnagar districts.

Though the plant growth at the Gandhinagar nursery yielded only four to five per cent rubber of the total dry weight of the plant, which is just one metre high, it is said the plant could easily produce 15 to 20 per cent rubber by improving its breed. Guayule plants can yield 250 kg of natural rubber per acre.

(ENS: December 18, 1985)

Final estimates of production of most of the Kharif crops for 1984-85 have not yet been received from the States. In case of rabi crops only preliminary assessments are available. Production in 1984-85 is expected to be around the level of 1983-84. A summary table showing the preliminary estimates of production of various crops in 1984-85 is given below:

Crop Prospects 1984-85

Crop	Unit	Likely production
Rice	M. tonnes	59.5-60.5
Wheat	"	46.0
Coarse Cereals	"	30.5-31.5
Pulses	"	12.5
Foodgrains		
(Kharif)	"	85.0-87.0
(Rabhi)	"	63.5
Foodgrains Total	"	148.5-150.5
Sugarcane	"	175.0
Oil seeds*	"	13.0
Cotton	M. Bales**	7.8
Jute & Mesta	"	7.8

* Nine major oilseeds including groundnut, castor seed, sesamum, rapeseed and mustard, linseed, sunflower, niger seed, safflower and soyabean.

** 170 Kg. for cotton and 180 Kg. for jute and mesta.

The Seventh Five-Year Plan has thus taken off from a happy setting. As in the previous Plans, Agriculture which is the source of livelihood of the overwhelming majority of our people would be given the highest priority keeping in view the thrust of the Seventh Five-Year Plan on food production, productivity and employment as recommended by the National Development Council. With the coming together of the Departments of Agriculture and Cooperation, Agricultural Research and Education and Rural Development under the same Ministry, the complete complementarity between agriculture and rural development could be more fully exploited for food production, productivity and employment.

Fertilisers. There has been a three-fold increase in the consumption of fertilisers during the last decade since 1975-76. During the Sixth Plan period, the consumption of fertilisers has increased at the rate of more than 6 lakh tonnes per annum on an average from the base level of 52.6 lakh tonnes in 1979-80 to 84 lakh tonnes in 1984-85.

In the last two years of the Sixth Plan, there has been a phenomenal growth in fertiliser use, the percentage increase in 1983-84 being 20.6 over the previous year. During kharif 1984 (April-September), the consumption of fertiliser is estimated to be of the order

of 38.00 lakh tonnes against 32.23 lakh tonnes in the same period in the previous year, implying thereby an increase of more than 22 per cent.

India has come to occupy the fourth position in the world in terms of gross fertiliser consumption next only to U.S.A., U.S.S.R. and China. The per unit are a consumption in India has also increased around three times during the last decade. But, in terms of this yardstick, India is still far behind the rest of the world and ranks among the bottom half of the countries.

Co-operatives constitute the major institutional agency for supporting agricultural programmes. The total agricultural credit disbursed by the cooperatives reached a level of Rs. 2,900 crore in 1983-84. Similarly, the value of a wide variety of agricultural produce marketed by the cooperatives was nearly Rs. 2,566 crore in 1983-84.

In the field of fertiliser manufacture, the Indian Farmers Fertiliser Cooperative Ltd. (IFFCO) accounted for 12.4 per cent of the nitrogenous fertiliser production and 25.5 per cent of the phosphatic fertiliser production in the country during 1983-84. About 70,000 cooperative retail outlets distributed fertilisers estimated at 33.75 lakh tonnes of NPK representing about 43.7 per cent of the total fertiliser distribution in the country. The cooperative sector accounted for 54 per cent of the national sugar production in 1983-84.

Agriculture which accounts for about 48 per cent of the national income is the kingpin of the national economy. It dominates the national scene.

Agriculture, in its turn, is dominated by foodcrops. As much as 75 per cent of the total cropped area is taken up by foodcrops. Both tradition and necessity have contributed to the pre-eminence of foodcrops in the country.

Crops and Seasons. There are two main crops seasons in India, the *kharif* and the *rabi*. These seasons have been determined by long usage, which itself has been determined primarily by rainfall. The *kharif* season opens in May and banks heavily on the south west monsoon. The *rabi* opens in the middle of October, as the south west retreats and the north east monsoon takes over.

Pre-monsoon rains (March to May) are important for the sowing of *kharif* crops like autumn rice and jute. The main monsoon (June to Sept.) covers the growth and harvesting of *kharif* crops. Post-monsoon rains (Oct. to Dec.) are essential for the *rabi* crops. If the monsoon is delayed or weakened it may lead to drought conditions. On the other hand, if the monsoon pours forth in full force, floods are likely to cause crop losses.

Food Crops account for a little over 80 per cent of the gross cropped area and non-food crops, the rest of the area.

Foodgrains make up 95.5 per cent of the total area under food crops. Sugarcane (1.8 per cent), fruits (1.7 per cent) and other food crops (1 per cent) account for the balance area of 4.5 per cent. Among foodgrains, cereals take up 82.6 per cent and pulses 17.4 per cent.

In the total area under cereals, rice leads with about 36 per cent, followed by wheat 18 per cent, jowar 16 per cent and bajra 13 per cent.

Pulses cultivation, either in rotation with cereals or inter-spaced with cereals, accounts for about 21 million ha. or 13.3 per cent out of the gross cropped area of 158 million ha.

Bengal gram represents the largest single item in pulses cultivation, accounting for an area of 7.4 million ha. Tur/Arhar/Red gram covers 2.4 million ha. The rest of the varieties are grown over an aggregate area of 11.3 million ha.

Spices. India is known as the home of spices. Out of the seventy spices listed by the International Organisation for standards, almost all of them are grown in India. The annual production of all the spices put together comes to 1.5 million tonnes. Though fairly large quantities are exported, bulk of the production is consumed within the country. The share of Indian exports in the world trade of spices is about 25%.

Pepper. Among the Indian spices, pepper is the most important. It is native to the Western Ghats of India. Though the country had a monopoly for pepper production earlier it now accounts for only 20% of the world output. Pepper is grown in an area of 1,10,640 hectares in the southern part of the country

Chillies

India is the largest producer and consumer of chillies in the world producing about 5.24 lakh tonnes of dried chillies reaped from nearly 8 lakh hectares.

Although a substantial portion of the total output is consumed locally, India is still one of the major exporters of this red spice (also called red pepper). It is exported to more than 40 countries, including the USA, Canada, Malaysia, Singapore, West Asia and South Korea.

One of the major spices grown in the country, chilli occupies about 40 per cent of the total area under spices and condiments. The principal chilli growing States are Tamil Nadu, Andhra Pradesh, Maharashtra, Karnataka and Orissa, both in terms of area and production. These five States put together account for 80 per cent of the national output.

Tamil Nadu produces the maximum quantity though in terms of area under chilli it stands fourth. The per hectare yield of Andhra Pradesh, which has a much larger area under chillies than Tamil Nadu, is much lower. Tamil Nadu accounts for 29 per cent of the total production and Andhra Pradesh 27 per cent.

Source: The Hindu.

producing 27,410 tonnes annually. The world's first and only hybrid variety, 'Panniyur-1' was evolved at the Pepper Research Station, Panniyur in Kerala State. Pepper is a small farmer's crop and generally grown as a mixed crop in the homestead gardens. The commercial grade, Malabar Garbled Extra Bold, fetches the highest price in the international market.

Cardamom. Cardamom, the Queen of Spices, is the next most valuable spice. The crop is indigenous to South India. India is the largest producer with 4,400 tonnes. West Asian countries are the major markets for Indian Cardamom. "Alleppey Green" is the most sought after cardamom in the world.

Ginger, Turmeric, Chillies. India is the

Area, Production and Yield

A: Area in lakh hectares P: Production in lakh tonnes/bales Y: Yield in kg. per hectare

Crop		1950-51	1980-81	1981-82	1982-83	1983-84
Rice	A	308.10	401.52	407.08	382.62	409.90
	P	205.76	536.31	532.48	471.16	597.68
	Y	668	1336	1308	1231	1458
Wheat	A	97.46	222.79	221.44	235.67	243.95
	P	64.62	363.13	374.52	427.94	451.48
	Y	663	1630	1691	1816	1851
Jowar	A	155.71	158.09	165.99	163.76	162.63
	P	54.95	104.31	120.62	107.53	119.34
	Y	353	660	727	657	734
Bajra	A	90.23	116.57	117.84	109.42	118.10
	P	25.95	53.43	55.37	51.31	76.24
	Y	288	458	470	469	646
Maize	A	31.59	60.05	59.35	57.20	58.88
	P	17.29	69.57	68.97	65.49	79.24
	Y	547	1159	1162	1145	1346
Total Cereals	A	782.30	1042.10	1052.95	1022.62	1069.36
	P	424.14	1189.62	1217.88	1176.62	1388.88
	Y	542	1142	1157	1151	1299
Gram	A	75.70	65.84	78.68	73.99	73.08
	P	36.51	43.28	46.42	52.90	47.55
	Y	482	657	590	715	651
Total Pulses	A	190.91	224.57	238.43	228.33	234.12
	P	84.11	106.27	115.07	118.57	126.55
	Y	441	473	483	519	541
Total Foodgrains	A	973.21	1266.67	1291.38	1250.95	1303.48
	P	508.25	1295.89	1332.95	1295.19	1515.43
	Y	522	1023	1032	1035	1163
Groundnut	A	44.94	68.01	74.29	72.15	76.41
	P	34.81	50.05	72.23	52.82	72.84
	Y	775	736	972	732	953
Rapeseed & Mustard	A	20.71	41.13	43.99	38.27	38.93
	P	7.62	23.04	23.81	22.07	25.66
	Y	368	560	541	477	659
Total Oilseeds	A	107.27*	176.03	189.07	177.55	186.95
	P	51.58*	93.72	120.80	99.95	128.14
	Y	481*	532	639	563	685
Sugarcane	A	17.07	26.67	31.93	33.58	31.67
	P	570.51	1542.48	1863.58	1895.06	1770.20
	Y	33422	57844	58359	56441	55904

* Five major Oilseeds, viz. Groundnut, Rapeseed & Mustard, Castorseed, Sesamum and Linseed

largest producer of ginger and turmeric in the world accounting for 60% and 90% the total output respectively. The annual production of ginger is around 80,000 tonnes and turmeric 1,99,000 tonnes. "Cochin ginger" and "Alleppey turmeric" get premium price in the international markets India is also the

world's largest producer of chillies (Capsicum) (see Box). The varieties commercially grown are of medium pungency. Export of chilli is negligible and more than 95% of the production is consumed locally. There is vast scope for growing the mildest paprikas to the most pungent chillies.

Other Spices. Several spices like coriander, cumin, fennel, fenugreek, celery, niseed, saffron etc., the annual production of which comes to 4,70,000 tonnes are grown in India. The areas under these crops are not extensive. However, these are very important spices as they form essential ingredients

in culinary, confectionery and medicinal preparations. Domestic consumption of these spices is quite substantial. Production and export of onion and garlic have also picked up recently. Apart from these spices, clove, nutmeg, cinnamon and vanilla are also grown in India.

113. DEVELOPING RURAL INDIA

India lives in its Villages. According to statistics, there are 5,75,000 Villages in India. The majority of them are inhabited while some of them are dead or deserted. Rural development has been given the utmost priority in the Seventh Five-Year Plan.

The Ministry of Rural Reconstruction was constituted under the Presidential Notification dated the 19th August, 1979, and continued as such till 23rd January, 1982 when it was renamed as the Ministry of Rural Development. By Presidential Notification dated the 4th January, 1985 it has again become the Department of Rural Development in the Ministry of Agriculture and Rural Development.

Rural Poverty. The major thrust of the programme of this Department is on strengthening the socio-economic infrastructure of development in the rural areas and the alleviation of rural poverty which has been one of the prime objectives of the Sixth Plan.

In order to alleviate the lot of the rural poor comprising the small and marginal farmers, landless labourers, rural artisans, etc. in 1984-85 Government continued the various programmes, such as the Integrated Rural Development Programme (IRDP), National Rural Employment Programme (NREP), Rural Landless Employment Guarantee Programme (RLEGP), Drought Prone Areas Programme (DPAP), Desert Development Programme (DDP), Development of Selected Regulated Markets, Development of Rural Markets, Establishing a National Grid of Rural Godowns, etc.

The Integrated Rural Development Programme, covers all the blocks in the country. It is meant for the benefit of the rural poor, with family as the basic unit of development. At least 30% of the families assisted under the Integrated Rural Development Programme should be from among the Scheduled Castes

and Scheduled Tribes. During the Sixth Plan period, it was expected that at the rate of 3,000 families per block, 15 million families would be assisted under this programme for improving their economic condition, with the ultimate objective of enabling them to raise their incomes above the poverty line.

The National Rural Employment Programme is meant mainly for providing wage employment to the rural unemployed. Simultaneously, it is expected that durable community assets would be created through the works taken up under the Programme. In addition, the programme aims at improvement of the nutritional status of the rural families as a part of the wages is given in the form of foodgrains. This Programme has played a significant role in tackling the problem of underemployment in the rural areas.

The Rural Landless Employment Guarantee Programme (RLEGP), which covers the whole country, is another anti-poverty programme. Its aim is to provide employment opportunities for the rural landless labourers particularly during the lean agricultural periods when work is scarce. Its objective is to provide employment to at least one member of each landless labour household for a period of upto 100 days in a year.

IRDP. The Integrated Rural Development Programme was launched in 1978-79 in 2300 Development Blocks which were earlier covered by special programmes like Small Farmers Development Agency, Drought Prone Areas Programme, Command Area Development etc. This Programme was ex-

tended to all the Development Blocks of the country with effect from the 2nd October, 1980. This programme is a part of the New 20-Point Programme.

As a major poverty alleviation programme in the Sixth Plan, the objective of the IRDP is to provide assistance to families below the poverty line to enable them to improve their income level and eventually cross the poverty line. This is to be achieved by providing productive assets to the identified families. The capital cost of the asset is subsidised to the extent of 25 per cent for small farmers, 33-1/3 per cent for marginal farmers, agricultural labourers and rural artisans and 50 per cent for the Scheduled Tribes. A family may receive upto Rs. 3000/- by way of subsidy.

In DPAP areas the limit of subsidy admissible is Rs. 4,000/-. Tribal beneficiaries can get upto Rs. 5000/- by way of subsidy. For meeting the balance of the cost of asset, credit is provided by the banking institutions. The Sixth Plan allocation for the programme is Rs. 1500/- crore, shared equally by the Centre and States. In addition, Credit to the extent of Rs. 3000 crore is to be mobilised during this period. Thus, the total investment under this programme would be approximately Rs. 4500 crore.

In physical terms, the programme aims at providing assistance to 15 million families during the Sixth Plan period. This is sought to be achieved by providing assistance to at least 600 families on an average in a Block in a year.

Since Scheduled Castes and Scheduled Tribes constitute a significant proportion of the population below the poverty line in rural areas, it has been laid down that at least 30% of the families assisted through IRD Programme should be drawn from SCs/STs. It has also been emphasised that at least 30% of the resources in terms of subsidy and loan should go to SC/ST beneficiaries.

Progress. There has been substantial progress in implementation of the IRDP during the last few years. The number of beneficiaries covered during 1980-81 was 27.27 lakh. It has gone up to 36.85 lakh during 1983-84. During this period, the per capita investment has increased from Rs. 1642 to Rs. 3201/. The subsidy credit ratio which was

1:1.82 in 1980-81 rose to 1:1.90 during 1983-84.

The achievement in extending the coverage to the SCs/STs has also been satisfactory. During 1980-81, the SC/ST families covered constituted 28.60 per cent of the total coverage while during 1983-84, the figure rose to 41.71 per cent.

For 1984-85 a budget provision of Rs. 216 crore existed towards central share of expenditure. Against this, funds to the tune of Rs. 140.45 crore have been released to the agencies in various States/UTs upto the end of February 1985.

During 1984-85, an amount of Rs. 274.82 crore has been utilised upto December 1984. Term credit of the order of Rs. 518.92 crore has been mobilised, during this period. As against the annual target of assisting 30.27 lakh families, 24.03 lakh have been assisted upto November 1984. Of these 10.18 lakh belong to SC/ST. The pace of progress during 1984-85 is even faster *vis-a-vis* the achievements for the same period during 1983-84. The targets are likely to be achieved in full.

Women, Children. Development of Women and Children in Rural Areas is a comparatively new scheme launched by the Department with effect from September 1982 and is being implemented on a pilot basis in 50 selected backward districts in different States, as a component of IRD programme. Through special efforts and provision of necessary inputs, the scheme seeks to enable rural women to participate more effectively in the rural development programmes in general and IRDP in particular.

The Special Livestock Production Programme (SLPP) was initiated in 1975-76 on the basis of the recommendations of the National Commission on Agriculture.

The programme is in operation in 183 districts in 21 States and 4 Union Territories. The programme consists of two parts, viz., (1) Cross-bred heifer rearing and (2) setting up of sheep, poultry and piggery production units. Under the scheme (i) assistance is provided at the rate of 50 per cent to small and marginal farmers and 66-2/3 per cent to agricultural labourers for feeding of cross bred heifers from 4th to 32nd months of age.

Under the scheme (ii) assistance is given

for setting up of sheep, poultry and piggery production units for which subsidy is provided at the rate of 25 per cent to small farmers and 33-1/3 per cent to marginal farmers and agricultural labourers, subject to a maximum of Rs. 3,000/- per beneficiary. In the case of tribal participants the rate of subsidy is 50 per cent subject to a maximum of Rs. 5,000/-.

Thirty per cent of the beneficiaries selected under the programme are to be from the Scheduled Caste/Scheduled Tribes communities. The expenditure on the programme is shared on a 50:50 basis with the State Governments and 100% to Union Territories. As its continuance as a separate scheme was not certain, only an outlay of Rs. 1.50 crore was provided for this scheme during 1983-84.

To continue the programme as a distinct scheme, an amount of Rs. 9.33 crore was provided in the Revised Estimates for the year 1983-84. During 1983-84, as per the information received so far Rs. 8.47 crore have been spent covering 77,672 beneficiaries (Cross-breed Calf rearing 45,171 and poultry, piggery and sheep—32,501). During the year 1984-85 34,797 beneficiaries have been covered upto December, 1984.

TRYSEM. The national scheme of Training of Rural Youth for Self-Employment (TRYSEM) was initiated with effect from 15th Aug. 1979. The main thrust of the scheme is on equipping rural youth in the 18-35 age group with necessary skills and technology to enable them to take vocations of self-employment.

Under the scheme, the target is to train about 2,00,000 rural youth every year at the rate of 40 rural youths per block. The scheme is an integral part of IRD Programme.

The selection of beneficiary families is based on income criterion i.e., a family having income of less than Rs. 3,500 per year is considered for selection. First priority is given to the poorest of the poor families and only one person is taken from each of the selected families. Preference in selection is to be given to those who have entrepreneurial aptitude. Priority categories for selection are Scheduled Castes, Scheduled Tribes, ex-servicemen and persons who have attended the nine months course under

National Adult Education Programme (NAEP). For women, a sub-target has been fixed for the coverage to the extent of one-third of the TRYSEM trainees.

The accepted modes of training are through industrial technical institutes, master-trainers, master-craftsmen, skilled artisans, industrial and servicing units, commercial and business establishments etc.

There are two types of financial assistance available under this scheme—(a) non-recurring and (b) recurring as shown below:

(a) *Non-recurring Assistance.* There is a provision of Rs. 5 crore in the Sixth Plan for strengthening of training infrastructure in different States/Union Territories. There is a separate budget provision for this. Assistance for strengthening of infrastructure can be granted only by the Government of India. All proposals have to be sent to this Department through the State Governments/UTs. Assistance is given in the form of grant-in-aid. It is a one-time grant. All institutions which impart, or are capable of imparting training to rural youth in any vocation leading to self-employment are eligible for assistance for strengthening their training infrastructure capabilities.

Assistance to central institutions, agricultural universities etc. and the institutions in the Union Territories is given cent per cent by the Government of India. Assistance to all other institutions is on 50:50 matching basis by the Central and the State Governments.

Institutional Credit. The Sixth Plan target is to assist 15 million families through IRDP programme. The financial allocation in the Sixth Plan has been Rs. 1500 crore and the total institutional credit to be mobilised was of the order of Rs. 3000 crore. The programme, thus had an investment of Rs. 4500 crore in the Sixth Plan for providing assistance to rural families below poverty line. During the years 1980-81, 1981-82, 1982-83 and 1983-84 institutional credit to an extent of Rs. 289.04 crore, Rs. 467.59 crore, Rs. 713.98 crore and Rs. 773.51 crore have been mobilised.

A major development in the field of institutional finance for rural areas (which took place in the year 1982) was the establishment of the National Bank for Agriculture and Rural Development (NABARD). On July 12, 1982,

this Bank took over all the functions of ARDC, along with certain functions of the Reserve Bank of India. Considering that the NABARD has a much wider charter than the erstwhile ARDC, it is expected that this Bank will be able to play its role of financing rural development in an integrated manner. Unlike ARDC, NABARD is also re-financing for secondary and tertiary sectors in rural areas, which constitute very important components of the IRD Programme.

Rural Employment. To tackle unemployment/underemployment in the rural areas, the National Rural Employment Programme (NREP) was launched in October, 1980 replacing the earlier Food for Work programme (FWP). It became a regular part of the Sixth Five Year Plan from 1st April, 1981 and since then it is being implemented as a centrally sponsored programme on 50 : 50 sharing basis between the Centre and the States.

It envisages generation of additional employment opportunities in the rural areas of the order of 300–400 million mandays every year, simultaneous by creating durable community assets to strengthen the rural infrastructure, and raising the nutritional standard of the rural poor. The programme operates in close conjunction with the on-going developmental works ensuring that employment and development support each other and the benefits flowing to the community are maximised.

For the Sixth Plan period, there was a total allocation of Rs. 1620 crore for the programme. Of this, the shares of the Central sector and State sector were Rs. 980 crore and 640 crore respectively. The entire expenditure in the first year i.e. 1980–81 was borne by the centre. The expenditure under the programme is likely to exceed the plan allocation substantially.

Land Reforms. The main objective of the land reform measures undertaken after independence was the removal of such institutional and motivational obstacles as stood in the way of modernisation of agriculture and a more egalitarian social structure. The following principal measures of land reforms have been implemented in fulfilment

of this objective:

(a) Abolition of intermediary tenures; (b) provision of security to tenants with the ultimate objective of conferring ownership rights on them; (c) imposition of land ceiling on agricultural holdings and distribution of surplus land to landless agricultural workers as well as small landholders; (d) preparation and maintenance of land records; and (e) consolidation of agricultural land holdings.

In pursuance of these, legislative measures have been enacted almost all over the country ever since the early 50s. By now intermediary tenures like zamindaris, jagirs, inams, etc. have been abolished all over the country. As a result of these measures, more than 20 million tenants have been brought in direct contact with the State. Besides this, several million acres of waste, fallow and other classes of land have rested in the state. A large proportion of this have been distributed to the landless and marginal landholders.

By now legislative provisions have been made in extensive areas of the country providing for conferment of ownership rights on tenants or allowing cultivating tenants to acquire ownership rights on payment of reasonable compensation to the landlord. Some of the states have acquired ownership of land from the landlords and have transferred it to the tenants who have to pay a certain compensation to the state.

Thus the states where ownership rights have been given to the general body of tenants through one measure or the other are Andhra Pradesh (Telengana Area), Assam, Gujarat, Himachal Pradesh, Maharashtra, Manipur, Orissa, Rajasthan, Tripura, Uttar Pradesh, Jammu & Kashmir, Karnataka, Kerala, and Madhya Pradesh. As a result of this, eight million tenants have acquired ownership of 7.2 million hectares.

Drought Prone Areas. Drought has been a recurring phenomenon in some parts of the country. These areas are poor, endowed with natural resources. Their economy is chronically stagnant and becomes still more so in years of scarcity. An enormous expenditure on scarcity relief measures was periodically incurred to save the local population from starvation. Government

ve been trying to solve the problems of the ironically drought affected areas in a systematic manner so as to provide some security to the inhabitants there. While it may not be possible to prevent droughts, at any rate in a decade or so, efforts have been made to alleviate their impact through a variety of schemes.

A Rural Works Programme was started in drought affected areas identified to be drought prone on the basis of a set of objective

criteria such as the smallness of the proportion of irrigated area, low and/or erratic distribution of rainfall and high frequency of drought. The principal objective of the programme was gradual mitigation of the severity of scarcity conditions. The programme focused mainly on the extension of rural works like medium and minor irrigation, soil conservation, afforestation, roads and drinking water supply schemes and generation of employment through them.

36% Rural India Has No Roads.

About 36 per cent of India's villages have remained without a roadlink at the end of the Sixth Plan and about 70 per cent villages do not have all-weather access roads.

This is despite "an impressive growth" in the spread of the transport network as claimed in the draft of the Seventh Plan.

While no figures were available for the First, Second and Third Plan periods, the number of villages connected with all-weather roads registered an annual three per cent growth rate between the Fifth and Sixth plans. From 1.52 lakh such villages in 1980, the number of villages with all-weather roads went up to 1.75 lakh in 1984-85.

The Seventh Plan draft further notes that the capacity of the entire transportation system, including the road network, continues to fall short of the demand for transportation notwithstanding the continued expansion of the system over the years.

Capacity constraints in the railways had led to movement of bulk commodities like coal over long distances by road at high cost to the economy, it points out.

Identifying rail and road as the dominant modes of transport, the draft predicted that they would remain so in the foreseeable future. However, there had been a marked shift in their relative shares with the share of road traffic increasing significantly over the years.

The transport infrastructure, it said, was burdened with overaged and obsolete

assets. The backlog of replacements had assumed "enormous proportions". While a quarter of the total length of the railway tracks was overdue for renewal, an equally substantial track kilometrage would become overaged in the Seventh Plan period.

Nearly 80 per cent of the equipment in the workshops and sheds needed to be replaced and a large proportion of the rolling stock had already outlived its economic life.

Besides 80 per cent of the State-owned road transport fleet, 47 per cent of the shipping tonnage and more than half the inland water transport flotilla would come up for replacement in the course of the Seventh Plan.

About one-third of the passenger aircraft would outlive their life.

Noting that the magnitude of the replacements was so big that the position could not be rectified during the course of a single Plan period, the draft recommended a phased programme of replacement spread over two five-year Plan periods.

At the same time, it wanted introduction of new technologies and modernisation of infrastructure to go hand in hand with replacements.

It also underlined the need for co-ordination and co-operation between the public and private sectors in view of the huge costs entailed in the construction and maintenance of an efficient transport system.

(ENS: October 24, 1985).

The allocation for the entire programme during the Sixth Five-Year Plan (1980-85) was Rs. 350.00 crore i.e. Rs. 175.00 crore under the Central Plan and an equal amount under the State Plans.

Rural Works Programme

Rs. in lakh

State	No. of Districts	No. of Blocks	Allocation Rs. 7.50 lakh per block	
1	2	3	4	5
1. Andhra Pradesh	7	66	495.00	
2. Bihar	2	31	232.50	
3. Gujarat	8	42	315.00	
4. Haryana	1	9	67.50	
5. Jammu & Kashmir	2	13	97.50	
6. Karnataka	10	70	525.00	
7. Madhy Pradesh	6	48	360.00	
8. Maharashtra	10	53	397.50	
9. Orissa	4	39	292.50	
10. Rajasthan	4	18	135.00	
11. Tamil Nadu	3	30	225.00	
12. Uttar Pradesh	10	63	472.50	
13. West Bengal	3	29	217.50	
	70	511	3832.50	

Desert Development. The Desert Development Programme as started in 1977-78 with the objective of controlling desertification and restoration of the ecological balance of certain desert and semi-desert areas and creation of conditions for raising the level of production, income and employment of the people of these areas. This was sought to be achieved by the following major activities:

(i) Afforestation (with special emphasis on shelter belt plantation, grassland development and sand dune stabilisation; (ii) optimum exploitation and conservation of ground-water; (iii) construction of water harvesting structure; (iv) rural electrification for energising tubewells and pumpsets; and (v) development of agriculture, horticulture, animal husbandry suited to the agro-climatic conditions of the area.

The programme covers both hot and cold desert areas of the country—17 districts in the hot deserts (11 in Rajasthan, 4 in Haryana and 2 in Gujarat) and 4 districts in the cold deserts (2 in Jammu & Kashmir and 2 in

Himachal Pradesh). This coverage was decided upon in the light of the recommendations of the Task Force on the DPAP and the DDP set up by the Department in 1980.

Agricultural Marketing. Agricultural marketing and warehousing in rural areas (including rural godowns) are also important. In agricultural marketing, the Department is assisted by the Directorate of Marketing and Inspection (D.M.I.) which is headed by the Agricultural Marketing Adviser to the Government of India. The Directorate of Marketing and Inspection has its head-office at Faridabad and Branch Head Office at Nagpur. Besides five regional offices at Delhi, Bombay, Madras, Calcutta and Guntur, the D.M.I. has 50-Suboffices located at various places throughout the country. Also, there is a chain of 21 Agmark laboratories all over the country with the Central Agmark Laboratory at Nagpur as the apex laboratory.

The enactment of Agricultural Produce Markets Acts has enabled the States/U. Ts. to establish regulated markets administered by Market Committees, on which are represented the producers, as well as the traders. As on 31-3-1984, there were 2045 principal markets and 3534 sub-markets which had been brought under regulation.

The development of agricultural produce markets is a State subject. This Department is, however, implementing the following two central sector schemes for providing central assistance to the State Governments for development of certain selected categories of markets. These schemes have been conceived to have a catalytic effect and not as the sole source of funding. Any expenditure in excess of the prescribed scales of central assistance is to be met by the Market Committees/State Marketing Boards/State Governments from their own resources or by raising institutional finance.

National Institute. The National Institute of Rural Development at Hyderabad continued its research and training activities during the year 1984. These activities had focus on problems of implementation of rural development programmes throughout the country.

The training programme had been de-

veloped on specific topics of concern to the personnel involved in the implementation of development programmes. Generally, the training programmes sought to identify the bottlenecks in the implementation of the programmes, analyse and discuss them from the point of view of finding solutions. Naturally, therefore, the participants in these programmes were government officers and functionaries of other organisations who had involvement in such issues. Thus the syllabi of each programme had need-based topics for discussion and clarification in the training sessions. This approach had been hailed as the most practical and useful by all those who have attended them.

It is now a settled feature that the officers of the Indian Administrative Service and the Indian Police Service spend some time at the Institute for refreshing their knowledge of various facets of rural development and the process of transformation that is going on in the rural areas.

Panchayati Raj. The Panchayati Raj system has been established in all the States and Union Territories except Meghalaya, Nagaland, Lakshadweep and Mizoram. A three-tier system is in existence in Andhra Pradesh, Bihar, Gujarat, Himachal Pradesh, Maharashtra, Punjab, Rajasthan, Uttar Pradesh, West Bengal, Arunachal Pradesh and Chandigarh.

A three-tier system also exists in Karnata-

ka and Tamil Nadu, but instead of Zila Parishad, they have the District Development Councils which are advisory bodies with no executive powers. Assam, Madhya Pradesh, Haryana, Manipur, Orissa, Dadra and Nagar Haveli, Delhi and Pondichery have a two-tier system and in the remaining States and Union Territories a one-tier system is operative. There are 2,17,319 Gram Panchayats, 4,526 Panchayat Samities and 297 Zila Parishads in the country.

To promote voluntary efforts in rural development, a Central Sector Scheme which was initiated in the Fifth Five-Year Plan, is being continued. Under this scheme of '*Promotion of Voluntary Scheme* and Social Action Programme', assistance is given to voluntary organisations and non-Government agencies for implementing experimental projects of public cooperation through people's participation.

The projects under this scheme can relate to any aspect of rural life reflecting the felt-needs of the people of the area. In the earlier years assistance was extended to State Governments/Union Territories also. From the year 1982-83, the assistance under the scheme was restricted to North Eastern States and Sikkim where many voluntary organisations were not available to take up such projects. With effect from 1984-85, the financial assistance to voluntary organisations under this scheme is routed through People's Action for Development (India) (PADI).

114. THE VANISHING FORESTS

In India forests are vanishing at an alarming rate. The unscrupulous woodcutters, charcoal suppliers and forest contractors raze down lush green woods without any hindrance. The ecological imbalances caused by a land mass denuded of forest cover has caught the attention of India's planners, of late.

The basic tenets of the country's forest policy are conservation and development. It is recognised that the forests are to be safeguarded and forests and tree-covers all over the country to be enlarged for meeting the basic needs of the people and the nation.

Further, existing natural forests are to be conserved for protection of environment and enlargement of the resource-base to meet

the energy, small timber and fodder requirements of the people. It will also be necessary to develop minor forest produce for providing sustenance for the forest-side communities.

Conservation Act. The operation of the Forest (Conservation) Act 1980 has restricted diversion of forest lands to non-forestry purposes. The average annual diver-

sion had been brought down from the level of 1.5 lakh ha. (before enforcement of the Act) to less than 6000 ha.

The Forest Survey of India is presently engaged in the preparation of a vegetation map of the country with the help of remote sensing techniques in collaboration with the Dept. of Environment. The survey is expected to be completed by the end of the current year providing an authenticated vegetation map of the country for the first time.

Afforestation, Social Forestry and Farm Forestry are the three important components of the New 20-Point Programme. As a result of systematic monitoring of the programme by senior officials of the Forestry Department, the programme of afforestation gained momentum during the year 1984-85. Encouraged by the spectacular achievements, higher targets have now been proposed for the year 1985-86.

The Project Formulation Cell of the Forestry Division continued its activities during 1984-85 and processed several projects for forestry development through financial and technical assistance from the international agencies, like World Bank, Food and Agriculture Organisation (FAO), United Nations Development Programme (UNDP), Swedish International Development Agency (SIDA), European Economic Community (EEC), Switzerland, Danish International Development Agency (DANIDA), etc.

Social Forestry. The Centrally sponsored schemes on social forestry (Social Forestry including Rural Fuel Wood Plantation) which was launched during 1980-81 in 101 fuel wood-deficient districts of the country and later extended to 157 districts during 1982-83 for meeting domestic and agricultural needs of fuel, fodder and small timber of rural communities, made encouraging progress during the year under review.

This scheme also included the programme 'A Tree for every Child' for which the Union Government provides assistance in the form of subsidy upto a maximum of Rs. 1000 per ha. for tree plantation and Rs. 250 for every 1000 seedlings raised for distribution among farmers and children. As against the target of planting 2.60 lakh ha. and distribution of about 58 crore seedlings, it is expected that

plantations in about 3.30 ha. would be raised and about 80 crore seedlings distributed.

Another Centrally Sponsored Scheme on 'Soil, Water and Tree Conservation in the Himalayas (Operation Soil-watch)' which was introduced during the Fifth Five-Year Plan envisaged treatment of identified catchments on micro-watershed basis with a view to preserving the fragile Himalayan eco-system was being implemented in 12 States and 2 U.Ts. As against the target of 1.10 lakh ha., about 1.16 lakh ha. are likely to be treated under this scheme by the end of the Sixth Plan.

Corporations. For the purpose of planned forest development in the States, Forest Development Corporations are functioning in 15 States and 4 U.Ts. These Corporations are primarily engaged in harvesting and marketing of forest produce with the object of eliminating middlemen in accordance with the policy decision of the Govt. Some of the Corporations have also diversified their activities by collecting and marketing minor forest produce like sal seeds and oilseeds aimed at helping the poor people, particularly the tribals living in and around forests.

In the matter of forestry research and education, various crash programmes dictated by the imperative need to produce greater bio-mass per unit time and space to provide for the energy needs of the nation and encouraging more efficient utilisation of forest produce to foster the theme of development without destruction, have been taken up.

Keeping in view the need for trained manpower, facilities for imparting training to the forest officials have been expanded. Simultaneously, action has been initiated for stepping up the annual intake in the Indian Forest Service.

The gap between the demand and supply of fuel wood, presently estimated at 89 million tonnes is expected to rise to 125 million tonnes by 2000 AD. For meeting the additional requirement of fuel, a two-pronged programme for raising fuel-wood plantations and promoting use of efficient stoves and bio-gas has been taken up.

Forestry, like agriculture, is a State subject and the State Governments administer the

India Losing Forest Cover

Satellite photographs of the Indian landmass have revealed that the country is losing its forest cover at an alarming rate of 1.5 million hectares per year and the total area under forests today may be as low as about 40 million hectares.

A study by the Department of Environment and Forestry has revealed that during the period 1972-75 the area under forests stood at 54 million hectares and when a similar study was carried out in 1981-82, it stood at 46 million hectares.

While none can dispute the accuracy of the satellite photographs, the statistics of the forest department shows that the area under forests is 74.74 million hectares. But official sources concede that the actual figure would be far less than that.

The existing forest policy prescribes that 33 per cent of the country should be forest. On paper today, it is put at 23 per cent but in reality good forest cover is perhaps only 11 per cent. And this 11 per cent is under continuous pressure to supply the population with forest produce way in excess of its capacity.

There is a yawning gap between demand and availability of firewood. With over 400 million head of cattle, the demand for fodder is far in excess of what the forests can sustain. So is the demand for forest materials for industrial and agro-based needs in excess of the supply. This has led to over-exploitation of forests leading to further destruction of the country's forest wealth.

In addition to this in ecologically sensitive areas such as the Himalayan region, the results of deforestation have been disastrous. It leads to a cycle where the soil cannot hold water and the run-off leads to the loss of valuable top soil and the

siltation of rivers, dams and to floods in many parts of the country.

To bring home to the people the dangers of the present trend in deforestation, a meeting was recently held under the chairmanship of the Minister of Environment and Forests Vir Sen. It discussed the mechanics of peoples' participation, identification of wastelands, species selections for planting, who would actually do the planting and other matters concerning the development of the infrastructure needed.

For 1985-86 a total of Rs. 250 crore has been earmarked to be spent as part of the approved annual plan of the Central and the State Governments on social forestry schemes outside forest areas covering communally owned lands and farm forests. In addition 20 per cent of the various schemes under the Department of Rural Development amounting to nearly Rs. 200 crore would be available for social forestry.

For 1986-87, the programme has been enhanced to conform to the national objective of planting five million hectares per year. This is aimed at not only halting the march of deforestation but to enhance the existing dwindling area under forests.

The meeting discussed the performance of the eco development projects undertaken by the department during the sixth plan period. It covers the development of technology and management package suitable for regeneration of degraded ecosystems, actual demonstration of the viability of developed packages in the field and demonstration of 'know-how' through a scheme of 'show how' so that practical application is made easier.

(ENS: Sept. 6, 1985)

forests. But the Union Government exercises a supervisory control. It has its own department under an Inspector-General of Forests in India.

According to the Union Minister of Agriculture, more than 4 million hectares of forest land have been deforested in the last 30 years. The new Act is expected to put a stop

to similar encroachments in future.

Forest Area. India's total forest area is 75.06 million hectares which is 22.88 per cent of the total geographical area of the country. The per capita forest area works out to 0.11 hectare which is extremely low. India's forest area constitutes 1.85 per cent of the world forest area (4057 million hectares) whereas the population forms 15.64 per cent of the world population (4335 million).

The state owns the greatest forest area, around 71.17 million ha. Corporate bodies account for about 2.48 million ha. and private individuals, the rest.

It will be seen that only Assam, H. Pradesh, Meghalaya, Orissa, A and N Islands, Arunchal Pradesh and Tripura exceed the national norm of 33.3 per cent laid down in the Forest Policy. Kerala, Goa, Daman and Diu and Manipur and Maharashtra maintain plus 20 per cent forest of their respective land areas. All the other States and U. Territories have low percentages of forest land and need urgent reforestation.

Botanical Divisions. Indian forests fall into five botanical types: (1) Evergreen (2) Deciduous (3) Dry (4) Hill (5) Tidal or Littoral.

Evergreen forests are found where the rainfall is 80" to 120", i.e. the Western Ghats and the sub-Himalayan regions in the east. Hard wood such as teak, ebony, rosewood and iron wood* are found in this area. Bomboos of all varieties thrive well here.

Deciduous forests or monsoon forests are seen in areas where the rainfall ranges from 60" to 80". These forests occupy the larger part of the Deccan plateau. The trees are big and provide fine timber—teak, sal, padauk, sandalwood, redwood, ariun etc.

Dry forests occur where rainfall is between 30" to 40". The desert regions of Rajasthan and South Punjab are such places. The plants here have thick and fleshy stems and leaves, and the forests mostly consist of thickets of shrubs with a few stunted trees.

Hill forests are found in South India above 5000 ft. and in the Himalayas above 3000 ft. elevation. The trees are evergreen and include the very best timber like oak, picea, deodar, pines, chestnut, walnut, maple, elm, ash and birches; laurels, poplars and rhododendrons also grow profusely here.

Forest in India—State-wise

States/Union Territory	(In thousand hectare)		
	Geographical area	Forest area	Percentage of forest area
AP	27675	6651	24
Assam	9662	3808	38
Bihar	17388	3085	17
Gujarat	19599	1940	9
Haryana	4422	136	3
H. Pradesh	5567	2165	38
J & K	22224	2081	9
Karnataka	19177	3520	18
Kerala	3886	1041	26
MP	44284	17299	39
Manipur	2236	602	26
Meghalaya	2248	757	33
Maharashtra	30776	6686	21
Nagaland	1653	310	18
Orissa	15584	6816	43
Punjab	5036	188	3
Rajasthan	34222	3764	11
T. Nadu	13007	2218	17
Tripura	1048	633	60
UP	29441	4571	15
W. Bengal	8785	1183	13
A and N Islands	829	635	76
Arunachal Pradesh	8358	5154	61
Chandigarh	11	...	...
D and N Haveli	49	...	...
Delhi	149	5	3
Goa, Daman and Diu	381	103	27
Lakshadweep	3	...	...
Mizoram†	...	...	...
Pondicherry	48	...	...
All India*	328048*	75351	23

†Included in Assam

* Included 8411 thousand hectares, the area under illegal occupation of Pakistan & China. One hectare is equivalent to 2.471 acres

Source: Eastern Economist

Littoral forests are found in the estuaries of great rivers like the Indus, the Ganges and the Mahanadi. The trees here provide exc

ant firewood and constitute a rich source of fuel.

Development Programmes.

Forest development programmes stress that are called *productive forestry* and *social forestry*. Productive forestry concentrates on raising man-made forests to meet the long term requirements of forest products in general and materials for wood-based industries in particular.

The Central Government has taken the lead in establishing State Forest Development Corporations, with central participa-

tion. These corporations are to be financially assisted by term lending institutions in India and wherever possible by World Bank and its associates. The corporations are expected to take up massive operations.

Social Forestry aims at augmenting fuel wood resources and minor wood for farmers by new plantations of fuel wood trees and small trees suitable for farm needs.

All forest produce other than wood are considered minor forest produce. These include bamboos and canes, grasses of various kinds, leaves of different trees, medicinal plants, gum, resin and lac.

115. OPERATION FLOOD

Now it is the time of Operation Flood II. Taking the cue from the success of Operation Flood 1 of 1970-81 which brought about a real breakthrough in milk production in the country, the second project was launched with a larger outlay and perspective. There are 238 dairy plants in the country today. They handle 92 lakh litres of milk per day.

The programmes for dairy development are mainly intended to generate additional incomes for millions of farmers and landless labourers having one or two heads of milch cattle, thereby helping them to cross the poverty line. Dairy farmers are motivated to organise themselves into strong co-operatives so as to dispense with the services of a host of middlemen in the milk trade.

Modern Concept. The foundation for a viable, modern and self-sustaining dairy industry based on co-operative concepts was laid in 1970 in the form of Operation Flood-I. Operation Flood-II Project was taken up for implementation from 1979 with an estimated outlay of Rs. 485 crore. Upto October, 1984, twenty-five States/Union Territories had executed the necessary agreement with the Indian Dairy Corporation (IDC) for the implementation of the project. Twenty-one perspective Dairy Development Plans have already been approved by the IDC out of the plans prepared by 24 States/UTs. The remaining are under scrutiny.

The major activities taken up under the Operation Flood-II Project include organisation of a three-tier co-operative structure at the producer, district and State levels, provision of technical inputs and establishing

processing capacities and marketing facilities in rural milk-sheds through the co-operative structure.

Achievements. The major achievements of the Project include the following:-

- (1) Funds amounting to Rs. 232.3 crore were generated by the IDC through sale of gift commodities upto November, 1984 as against Rs. 191.5 crore by December, 1983.
- (2) The four city dairies in Bombay, Delhi, Calcutta and Madras were able to expand their capacity from 31 lakh litres to 35 lakh litres per day by the end of October, 1984.
- (3) The number of village co-operatives in the 96 districts covered by the Project rose to 31000 with a total membership of 33.8 lakh farmer-members as compared to 23316 societies covering 25.2 lakh members in December, 1983.
- (4) About 5238 societies are providing liquid semen facilities and have performed artificial inseminations on nearly 59 lakh animals between April and October, 1984.
- (5) The National Milk Grid which off-sets regional and seasonal imbalances in milk collection, made further progress during the year. Towards this objective, a fleet of 622 road and 87 rail milk tankers with a capacity

of 70.5 lakh litres and 31 lakh litres respectively, aided the long distance milk movement.

To augment storage facilities for dairy commodities, a godown with a capacity of 3,000 tonnes at Bombay was commissioned, while a cold store/deep freeze with a capacity of 1,000 tonnes is expected to be commissioned shortly. Another 3,000 tonnes capacity godown is under construction at Calcutta.

There are, at present, a total number of 238 dairy plants of various sizes and dimensions in the public and co-operative sector functioning in the country. Altogether, these plants handled on an average more than 92 lakh litres of milk per day during the year as against 86.5 lakh litres per day during the preceding year.

Low Yield. Though India had about 352 million cows the total production of milk in India worked out to an average of about 157 kg milk per animal per year. This is very low compared to 4154 kg in USA, 3950 kg in UK, and 3902 kg in Denmark. The Indian buffalo does much better with 504 kg per year but even this is only one-seventh of what it is in some advanced countries.

Per capita availability of milk in India, according to Dr. V. Kurian, Chairman of the National Dairy Development Board, was 137 gm daily in 1940 when such an estimate was first made. It declined continuously to reach 108 gm in 1970. Thereafter, availability has increased to 118 gm per day in 1977 and further to 122 in 1979. Even this record is dismally low compared to the world situation which itself had been steadily deteriorating. In 1970 while the average world availability was 288 gm, Indian supply stood at 108 gm.

India was thus perennially short of milk. To make matters worse, what little milk the country produced was disposed of in the most haphazard manner. This affected the producer and the consumer adversely. The only workable solution to this problem was commercial dairying. Operation Flood Project was therefore conceived as the foundation for a big dairy industry in India which would increase and stabilise milk production and also provide a steady supply of milk or milk products at reasonable prices.

Urban Problem. Whenever a shortage or dislocation of milk supply occurred,

the worst sufferers were the urban families. In view of this, the four metropolitan cities of India—Bombay, Calcutta, Delhi and Madras—were selected as the first targets of Operation Flood.

The Operation Flood Project is entirely based on food aid from the World Food Programme (WFP) which is expected to cost 153 million dollars. The WFP has offered India 126,000 tonnes of skimmed milk powder (SMP) and 42,000 tonnes of butter oil (BO) as a grant. It was understood that through the sales of these commodities Rs. 116.4 cr. would be generated and deployed for the Operation Flood project.

The Indian Dairy Corporation (IDC) was set up as a government company in 1970 under the Indian Companies Act. The Corporation was entrusted with the administration of Operation Flood projects, that is to say, with the milk marketing and dairy development project under the World Food Programme.

National Board. National Dairy Development Board, which was constituted in September, 1965 under the Societies Registration Act, 1860, was to assist the IDC in all technical matters.

Operation Flood I was launched in July 1970 with the aid from the World Food Programme (WFP) in terms of skimmed milk powder (SMP) and butter oil (BO) to bring about a real breakthrough in milk production so as to free the rural population from the grip of poverty. Initially introduced as Five-Year Project (1970-75), it was finally concluded on March 31, 1981, after 11 years.

The immediate objective in launching Operation Flood I was to secure a commanding share of the liquid milk market in the four metropolitan cities of Bombay, Calcutta, Delhi and Madras and to stabilise the supply and consumption of milk in these cities. This object has largely been achieved.

As regards the more substantive long term objective of increasing national milk production and supply, OF I has not made much headway. The organised production and procurement of milk under this scheme is only 80 lakh litres (production) and 30 lakh litres (procurement) per day as against an India targeted daily milk production of 81 lakh litres originally programmed for 1978-80.

Nevertheless, much has been achieved. The total milk production of the country stood at 30 million tonnes (1979-80) which shows an increase of 9 million tonnes over the pre-project level (1970) of 21 million tonnes. This increased per capita milk consumption from 10 gm per day in 1969 to 122 gm in 1979-80.

In processing milk for supply to the four metropolitan cities, the project has achieved its target of 29 lakh litres per day. Financially, the project has been a success too. Against an amount of Rs. 112.7 cr. generated through the sale of donated commodities till 31 October, 1980, the total expenditure under the project was Rs. 112.2 cr.

Milk Products. The consumption of liquid milk in India is very poor, hardly 40% of the total milk supply. The balance of 60% is converted into various milk products like ghee, dahi, butter and others. Ghee by itself claims around 33% of the aggregate milk supply. Apart from their direct consumption these products are used to manufacture high-priced items.

Sweets apart, the other milk products are milk powder, processed food such as baby food, beverages, cheese and butter. The production of milk products in 1979-80 was estimated at 32,600 tonnes of milk powder, 35,000 tonnes of baby milk powder, 22,500 tonnes of malted milk powder, 5600 tonnes of condensed milk and 930 tonnes of cheese. The total production of all varieties of milk powder was 68,100 tonnes in 1979-80 as against 59,530 tonnes in the preceding year.

A disturbing trend in urban milk supply is the rising prices. Between 1970 and 1980 the price of milk has nearly trebled itself.

Part of this price rise can be attributed to inflation but the better part is accounted for by heavy overheads, transport charges and intermediary profit. One report goes so far as to say "There are numerous intermediaries between the producing centres and the consuming centres who make urban consumers to pay through their noses, while the poor farmer is deprived of the price rise."

116. ASIA'S LARGEST RAILWAYS

Indian Railway has grown into Asia's largest and the world's fourth largest railway system from a modest beginning in April 1853 when the first train steamed off from Bombay to Thana, a stretch of 34 km. It had a route kilometrage of 61,385 on 31st March, 1983. It is also the biggest public undertaking in the country.

The first railway in India as also in Asia was opened by the Great Indian Peninsular Railway Company (now the Central Railway) formed in England. The company took up the survey in 1850. In about 3 years the work was completed and the first train steamed out of Bombay on April 16, 1853. The train ran from Bombay to Thana—a distance of about 34 km. A new chapter in the history of India was thus opened.

The development of Indian railways owes much to Lord Dalhousie who became the Governor General of India in 1848. It was he who suggested a system of trunk lines connecting the hinterland of Bombay, Bengal and Madras Presidencies with their principal ports and with each other. But the Government had neither the funds nor the technical personnel to undertake the work. So the work was entrusted to private companies

who were guaranteed a return of 5 per cent on their capital for a period of 25 years and free land needed for the railway. In return the companies were expected to share their surplus profits with the government and to sell the railway to the government after 25 years.

But the expected profits failed to materialise and the guaranteed interest continued to be a drain on government resources. So the Government purchased the railways on the expiry of the period of the contract, though the companies continued in management. Following the recommendations of the Ackworth Committee the Government took over the management of the bulk of the railways in 1922.

Expansion. The 1920's were a period of expansion for the railways. New lines were

taken up. In 1925 electric traction was introduced. The first electric railway was opened on February 5, 1925 from Victoria Terminus (Bombay) to Kurla. Then followed bad days for the railways with the depression of the 30's and the Second World War. The partition of India in 1947 made matters worse.

The partition left India with 54,151 km of railway line while Pakistan got 11,066 km. What came as India's share was distributed among the Provinces and 500 and odd Princely States. It was, in fact, a ramshackle railway organisation shared by 42 different units of varying sizes, some of them managed by the Government of India, some by Princely States and some by private companies.

The old Princely State of Sangli, for instance, owned a mere 7 km of railway, while the Nizam of Hyderabad managed 2335 km. With the accession of the Indian States to the Union of India, 10,672 km of railways, belonging to different Princely States, were integrated with the government railways in 1950.

Administration. The Indian Railways network is owned and managed by the Central Government. The operations are controlled and directed by the Railway Board under the overall supervision of the Minister for Railways. The Board has five members including the Chairman. The Chairman is Ex-Officio Principal Secretary, and each of the other four Members an ex-officio Secretary to the Government of India.

The Board thus performs the dual functions

Zonal Divisions

Railway	Headquarters	Route kilometres
Central	Bombay VT	6371
Eastern	Calcutta	4235
Northern	New Delhi	10935
North Eastern	Gorakhpur	5163
Northeast	Maligaon	
Frontier	(Gauhati)	3580
Southern	Madras	6701
South Central	Secunderabad	7025
South Eastern	Calcutta	7041
Western	Bombay Churchgate	10293
Total		60,935

of a secretariat to the Ministry of Railways and that of an executive body responsible for railway operations. The Railways' annual budget is approved by Parliament and accounts are audited by the Comptroller and Auditor General of India.

The railway net-work is divided into nine *Zonal Railways* each headed by a General Manager. The Zonal Railways are organised on the divisional pattern. The nine Zonal Railways with the route kilometres traversed by them are given below:

In addition there are three Production Units, viz the Chittaranjan Locomotive Works, Chittaranjan, Integral Coach Factory, Perambur (Madras) and Diesel Locomotive Works, Varanasi, each under the charge of a General Manager engaged in the manufacture of rolling stock. In addition, a Wheel

Progress of Railways

	Route length (Km)		Total	Running track (Km)	Passengers originating (lakh)	Goods originating (lakh tonne)
	Electrified	Non-electrified				
1950-51	388	53,208	53,596	59,315	12,840	930
1960-61	748	55,499	56,247	63,602	15,940	1,562
1965-66	2,423	55,976	58,399	68,375	20,820	2,030
1970-71	3,706	56,084	59,790	71,669	24,311	1,965
1975-76	4,659	55,557	60,216	74,255	29,452	2,233
1980-81	5,345	55,895	61,240	75,860	36,125	2,200
1981-82	5,473	55,757	61,230	75,964	37,044	2,458
1982-83	5,815	55,570	61,385	76,197	36,554	2,560

Axles Plant being set up at Bangalore under the charge of a General Manager is expected to commence production of wheels and axles by the latter half of 1982. There is also a Research, Designs and Standards Organisation at Lucknow which is an attached office of the Railway Board and is headed by a Director General.

Total Assets. Indian railways had total assets of Rs.8,882 crore on 31 March 1983 and staff strength of over 15.8 lakh regular employees. During 1982-83 they carried 5.54 crore passengers and 256 crore tons of freight traffic. Indian railways run about 11,000 trains every day, connecting 668 stations. The Indian railways operate on three gauges—broad gauge, metre gauge and narrow gauge. The operational fleet consisted of 10,087 locomotives, 37,539 coaching vehicles and 3,83,429 wagons.

The progress of the government railways over selected years since 1950-51 has been given in tables.

The Tables also show the trend towards modernisation of railways. The electrified route length has increased more than 14 times since 1950-51. Steam locomotives, production of which was discontinued from 1972, are being gradually replaced by electric and diesel locomotives.

Since the beginning of the five-year plans since 1950-51, the number of diesel locomotives has gone up by more than 155 times, from a mere 17 in 1951 to 2,638 in 1982-83 and of electric locomotives by more than sixteen times i.e., from 72 to 1,157.

Diesel and electric locomotives together formed 94.6 per cent of the total goods traffic in terms of gross tonne km in 1982-83. Modernisation and improvement of signalling and telecommunications have also made much headway. In 1982-83, a multi-channel microwave link was in operation for 13,725 km. Automatic signalling was provided on 1,304 km track.

Great Progress. Indian railways have made remarkable progress in attaining self-sufficiency in equipment and stores. At the beginning of the era of planned development since 1950-51, Indian railways were importing about 23 per cent of their equipment and stores. Such imports were reduced to 8.7 per cent in 1982-83.

Railways Running Behind

The supplementary grants of Rs.433 crore approved by Parliament for 1985-86 will make at best a marginal difference to the resources crunch that the railways face in the Seventh Plan.

It is true that in 1985-86 the outlay for railways will increase from Rs.1,650 crore to Rs.2,050 crore. However, after adjusting for an inflation rate of 6 percent in the current year, the Plan spending in 1985-86, in real terms, will amount to Rs.1,930 crore, which is no more than 15.6 per cent of the total Seventh Plan outlay of Rs.12,334 crore at 1984-85 prices.

In physical terms, again, if the revised targets for 1985-86 are any indication, only 13 per cent of the wagon procurement targets and 16 percent of the track renewal targets set for the Seventh Plan will be achieved.

The haulage capacity of the railways suffered sharply during the Sixth Plan period. As against the target of 309 million tonnes, later revised downwards to 282 million tonnes, the railways could achieve a freight traffic of only 237 million tonnes by 1984-85.

Also, despite the addition of 72,000 wagons during the Sixth Plan the number of wagons actually declined from 405,183 in March 1980 to 375,746 in March 1984. Faced with a growing resource shortage, the planners have not provided sufficient funds to the railways.

There has also been a progressive increase in expenditure on development of railways under the five-year plans. It was Rs.422.26 crore, Rs.1,043.70 crore, Rs.1,685.84 crore, Rs.1,420.88 crore and Rs.1,491.93 crore in the First, Second, Third, Fourth and Fifth Plans respectively.

Railway locomotives are built in the Chittaranjan Locomotive Works (CLW), Chittaranjan, and the Diesel Locomotive Works (DLW), Varanasi both of which are administered by the Ministry of Railways. CLW

Rolling Stock

Year	Number of locomotives				Number of coaching vehicles ¹	Number of Wagons
	Steam	Diesel	Electric	Total		
1950-51	8,120	17	72	8,209	19,628	2,05,596
1960-61	10,312	181	131	10,624	28,439	3,07,907
1965-66	10,613	727	403	11,743	32,922	3,70,019
1970-71	9,387	1169	602	11,158	35,145	3,83,990
1975-76	8,496	1803	796	11,095	36,821	3,95,250
1980-81	7,469	2403	1036	10,908	38,327	4,00,946
1981-82	7,245	2520	1104	10,869	37,960	3,92,062
1982-83	6,292	2638	1157	10,087	37,539	3,83,429

¹ Includes Electric Multiple Units (EMU)

produced its first engine in 1950-51 and achieved a production level of 173 locomotives per year during 1959-60.

In December 1971, it produced its last steam engine, taking its total production to 2,351 units before it switched over to the manufacture of mainline electric and diesel hydraulic shunting locomotives. During the same period, most of the metre gauge steam engines were built by TELCO, a private sector firm.

Electric Loco. CLW turned out its first DC electric loco in 1961-62 and the first diesel-hydraulic shunter in 1967-68. Overall production till March 1983 totalled 931 electric locos, 450 diesel-hydraulic locos. This included 4WAP-1 electric locos fitted with two stage suspension flexi-coil bogies having a speed potential of 130 km/hr and 4 medium hp diesel electric shunters (WDS-8) for steel plants.

Diesel electric main line locos as also heavy duty shunters are built by DLW. This unit commenced production of broad gauge locomotives in 1963-64 and from 1968-69 it also started manufacturing metre gauge locomotives. No diesel electric locos have been imported since then. Upto March 1983 this unit had delivered 1,733 locomotives of various types. The bulk of the passenger service vehicles are manufactured in the Integral Coach Factory (ICF), Perambur, which is also administered by the Ministry of Railways. ICF's production is supplemented by two public sector undertakings—Bharat Earth Movers Ltd., and Jessops. These three

together meet the entire requirements of the railways.

Passenger Coaches. Since ICF commenced production of passenger coaches in 1955-56, it had turned out 14,188 passenger service vehicles (fully furnished coaches) till March 1983. The passenger service vehicles produced by ICF and Jessops include EMUs. The electrical equipments for these are manufactured by another public sector unit—Bharat Heavy Electricals Ltd.

The railways' requirement of wagons is met mostly by the industry which includes units both in the public sector and private sector. Three railway repair workshops supplement the production of these units. In 1982-83, production totalled 14,088 wagons in terms of 4-wheelers, of which 13,045 were turned out by the industry.

Railways' requirements of wheels and axles are at present met only in part by indigenous production and the rest are being procured from foreign manufacturers. In order to prevent heavy drain on foreign exchange, the railways are setting up a wheel and axle plant at Yelahanka, Bangalore. This plant will produce approximately 70,000 wheels and 23,000 axles per year.

Passenger Traffic. The passenger traffic was over 36.5 crore in 1982-83 against 12.8 crore in 1950-51. The earnings from the second class passengers were Rs.1.029 crore in 1982-83 as compared to Rs.84.47 crore in 1950-51.

The average rate charged per passenger for every kilometre was 4.13 paise (ordinary) and 6.12 paise (mail/express) for second class, 21.1 paise for first class and 46.3 paise for air-conditioned class.

The task of providing improved amenities is a continuous process. One hundred and twentyone more water coolers were provided during the year, raising the total number of coolers to 3,295. Out of 7,068 stations, 5,794 have been electrified. Catering facilities have been provided at 3,253 stations and on 88 pairs of trains.

The railways carried about 25.6 crore tonnes of goods in 1982-83 as compared to 9.3 crore tonnes in 1950-51. The freight revenue was Rs.2,865.9 crore in 1982-83. To speed up movement of freight, many fast goods trains have been introduced on important routes.

To provide door-to-door service, a container service is also operated. The containers are carried on guaranteed schedules by fast goods trains. A freight forwarder scheme for movement of goods in wagons was in operation on 66 routes during 1982-83. A total number of 21,820 wagons were loaded in this scheme during the year.

Welfare. Several schemes are in operation for the welfare of the railway employees who numbered 17.9 lakh (15.8 lakh regular and 2.1 lakh casual) in 1982-83 as against 9.1 lakh in 1950-51. Among the important amenities are the provision of housing and medical facilities, holiday homes at hill stations and schools and hostels. Between 1951 and 1983 (31 March) about 5.87 lakh residential units, 106 hospitals and 595 health centres were maintained for the staff. The number of holiday homes at hill stations and other places was 33.

The Research, Design and Standards Organisation (RDSO), Lucknow, set up in 1957 has helped the railways in indigenisation in all fields of railway operations and has also made it possible for them to export a number of items of railway equipment.

The railways have four major training institutions. These are Railway Staff College, Vadodara; Indian Railways Institute of Advanced Track Technology, Pune; Indian Railway Institute of Signal Engineering and Telecommunications, Secunderabad; and Indian Railway Institute of Mechanical and Electrical Engineering, Jamalpur. These institutes also train foreign officials.

117. ROADS AND WATERWAYS

With more than 5.5 lakh km long roadways, India has one of the largest road networks in the world. Her navigable waterways come to around 10,000 km, but mechanised crafts make little use of them. Only 1/3 of India's major riverways are being used for mechanised navigation.

The total road length comprising national highways, state highways and other state PWD roads was 5,54,478 Km in 1980-81. The road development programme envisaged under the Sixth Plan laid emphasis on a coordinated and balanced development of road network in the country under (i) primary road comprising national highways, (ii) secondary and feeder road system covering state highways and major district roads and (iii) rural roads including village roads and other district roads. Substantial outlays are proposed for road development in the rural and the tribal areas.

In the first three plans and the three Annual Plans, a sum of Rs.1,134.86 crore was

spent on road development. The Fourth Plan and Fifth Plan expenditure was Rs.826.94 crore and Rs.1,348 crore respectively. The outlay for road development under the Sixth Plan for central sector was Rs.830 crore and for state sector Rs.2,609 crore.

National Highway. The Government is directly responsible for the national highways system. In 1947, approximately 2,500 km of missing road links and thousands of culverts and bridges, which did not exist were required to be constructed to have an integrated and continuous network. There was an increase in the missing road links owing to the addition of new roads to the national highways system in later years.

Upto 31 March 1983 road links including diversions constructed totalled 4,494 km, and improvement to low grade sections completed in 22,959 km, widening and strengthening single lane sections to double lane carriageway done in 21,848 km and 388 major bridges constructed. The present national highways system includes a total road length of 31,398 km. An outlay of Rs.660 crore was provided in the Sixth Plan for the development of national highways.

State highways and district and rural roads are the responsibility of state governments and are maintained by various agencies in the states and union territories. Roads are being developed in rural areas under the minimum needs programme the objective being to link all villages with a population of 1,500 and above and 50 per cent of the villages with a population of 1,000-1,500 with all-weather roads by 1990. The Government also assists in the development of certain

Length of Roads in India

State/Union Territory	Surfaced Roads (km)	Unsurfaced Roads (km)	Total (km)
1. Andhra Pradesh	36,263	3,576	39,842
2. Assam	6,283	18,393	24,676
3. Bihar	16,720	811	17,531
4. Gujarat	12,206	647	12,853
5. Haryana	18,260	2,259	20,519
6. Himachal Pradesh	3,931	12,965	16,896
7. Jammu & Kashmir	6,115	2,667	8,782
8. Karnataka	50,532	14,096	64,628
9. Kerala	15,653	2,349	18,002
10. Madhya Pradesh	48,429	14,955	63,384
11. Maharashtra	27,881	5,277	33,158
12. Manipur	1,865	1,699	3,564
13. Meghalaya	2,557	1,876	4,433
14. Nagaland	681	3,802	4,483
15. Orissa	12,832	5,155	17,987
16. Punjab	32,459	—	32,459
17. Rajasthan	30,511	10,311	40,822
18. Sikkim	993	—	993
19. Tamil Nadu	35,512	315	35,827
20. Tripura	1,117	3,186	4,303
21. Uttar Pradesh	47,796	13,019	60,815
22. West Bengal	15,351	1,671	17,022
23. Andaman & Nicobar Islands	591	34	625
24. Arunachal Pradesh	2,032	3,031	5,063
25. Chandigarh	14	—	14
26. Dadra & Nagar Haveli	184	34	218
27. Delhi	297	—	297
28. Goa, Daman & Diu	2,139	1,550	3,686
29. Lakshadweep	—	—	—
30. Mizoram	248	876	1,124
31. Pondicherry	459	10	469
Total	4,29,914	1,24,564	5,54,478

National Highways 31,710 Km.

The total length of National Highways in 1984-85 has been 31,710 km including 285 km length of newly declared NH. No. 56 linking Lucknow—Varanasi via Sultanpur and Jaunpur in UP and NH. No. 4B linking Nhava—Sheva Port complex with NH. 4 and NH. 17. Development of this system to provide for free flow of traffic by constructing missing road links, bridges over unbridged crossings, improving low grade sections, widening and strengthening the pavements of existing highways, improving geometrics, etc., is receiving attention.

Expenditure of about Rs. 1364.40 crores was incurred on development (original) works of National Highways from the inception in 1947 upto 31-3-1984. An amount of Rs. 165 crores is expected to be spent on development and Rs. 70 crores on maintenance of National Highways in the country during 1984-85.

Roads of Inter-State Importance: Initiated in May, 1954, the scheme seeks to promote inter-State road communication facilities, as also to help the States in their economic development through construction of road/bridges of Inter-State or Economic Importance. An amount of Rs.571.67 lakh has been released during the year 1983-84 for this scheme. A

provision of Rs.7.00 crore exists in Budget Estimate for 1984-85.

State Road Transport Undertakings: Together 57 State Road Transport Undertakings commanding a fleet strength of 82,259 vehicles are catering needs of 4 crore passengers every day. Performance of these STUs has been engaging the attention of the Central Government/State Govts. State Govt. have appointed a high powered committee to make in-depth studies of the performance of their undertakings with a view to improve their physical and financial performance. A quarterly review of performance is also undertaken at the Central level by the Planning Commission of these STUs.

The Govt. of India assists those STUs which have been registered under the Road Transport Corporation Act, 1950 through capital contribution in the shape of loans of matching basis i.e. 50% of the amount provided by the Central Govt. The work relating to grant of capital contribution has come to this Ministry from the Railways w.e.f. 1-4-1983. An amount of Rs.38.50 crore was disbursed during 1983-84, as against the provision of Rs.40 crore in Budget Estimate. In 1984-85, an amount of Rs.30.75 crore has been disbursed upto 31-12-1984.

selected roads in the states.

Border Roads. The Border Roads Development Board was set up in March 1960, for accelerating economic development and strengthening of defence preparedness through rapid and co-ordinated improvement of road communication in the north and north-eastern border areas. The development activities now encompass Rajasthan, Jammu and Kashmir, Himachal Pradesh, Madhya Pradesh, Sikkim, Assam, Uttar Pradesh, Meghalaya, Nagaland, Tripura, Manipur, Bihar, Andaman and Nicobar Islands, Arunachal Pradesh, Mizoram and also Bhutan.

Border Roads Organisation (BRO) ex-

ecutes its works departmentally (unlike MES, CPWD, etc., who execute works through contracts. The BRO is the largest single departmental undertaking for construction of roads. It is a self-sufficient force, mechanised and mobile, and during national emergencies provides engineering support to the Army.

Transport. Most of the states and union territories have nationalised passenger transport in varying degrees. In the country as a whole, 60 per cent (estimated) buses were being run by the public sector undertakings. Statutory corporations have been set up under the Road Transport Corporation Act, 1950 in several states.

In other states, the nationalised services are operated by departmental or municipal corporations or registered companies. In most of the big cities, bus service are state-owned. Goods transport is almost exclusively in the private sector.

For removal of constraints on the movement of goods by road transport, a scheme of national permits for public carriers was introduced in 1975. Under the scheme, the Government has specified the number of national permits each state/union territory, can issue. The maximum number of permits to be issued initially was fixed at 5,300 which was raised to 8,300 in 1979, 16,600 in 1980 and now to 24,900. So far, about 17,800 national permits have been issued.

For the implementation of the zonal permit schemes, reciprocal agreements are concluded between various participating states forming a zone. The deliberations and the agreements are done under the auspices of Inter State Transport Commission (ISTC). The agreements are revised/reviewed as and when necessary.

Vehicles Fleet. Passenger vehicles fleet in the public sector increased to over 82,259 in 1983 from 35,193 in 1970. About 4 crore commuters are carried every day by the state transport undertakings which employ about 5.70 lakh people.

To ensure co-ordination between the central and state policies and operation of the different modes of transport, the Government has set up a Transport Development Council. The Inter State Transport Commission, a statutory body, is responsible for the development, co-ordination and regulation of road transport services on inter-state routes. As a result of the efforts made by the Commission, almost all the states and union territories now have reciprocal arrangements for operation of goods and passenger service of inter-state routes. They have introduced zonal permit schemes for the unhindered movement of limited numbers of public goods carriers over the national and state highways on payment of tax at a single point.

An Association of State Road Transport Undertakings, set up in 1963, co-ordinates the activities of 58 state undertakings and helps to secure procedural uniformity, high-

Solatium For Accidents

Consequent upon the amendment of the Motor Vehicles Act, 1939, in October, 1982, a Solatium Fund Authority and a Solatium Fund were established under the administrative control of Shipping and Transport Ministry.

Solatium Fund has been established with an initial amount of one crore. This is augmented every year by contribution from the G.I.C., Central Government and State Govt. The 70% contribution is by the G.I.C. and other Insurance Companies, 15% by the Central Government and the remaining 15% by the State Governments. The fund is meant for giving solatium (compensation) to the victims of hit and run motor accidents i.e. the accidents arising out of the use of a motor vehicle the identity whereof cannot be ascertained in spite of reasonable efforts made for the same.

Till the end of March, 1984, an amount of Rs.30.83 lakh was placed at the disposal of the State Governments/Union Territory Administrations. A further amount of Rs.11.80 lakh also has been released to them during 1984-85. According to the information received from State Governments/UT Administrations, 215 cases have been fully settled and solatium has been sanctioned. The claims for solatium as and when received are scrutinised expeditiously for settling them.

er standards of service and economic operation.

Rivers. India has about 5200 km of major rivers, which are navigable by mechanised craft, but only 1,700 km is actually utilised. As regards canals, the available length is 4,300 km but only a length of 485 km is suitable for mechanised craft, of which only 331 km is being actually utilised.

Important among the navigable rivers are the Ganga and the Bhramaputra and their tributaries, the Godavari, the Krishna, the

Mahanadi, the Narmada and the Tapi and their canals; the backwaters and canals of Kerala; the Buckingham canal in Andhra Pradesh and Tamil Nadu, the Cumbarjun canal and Mandovi and Zuvari rivers in Goa and the network of tidal rivers in Sunderbans.

Inland water transport is a state subject. The development schemes are mostly taken up by the states as centrally sponsored schemes. In the Sixth Plan, provision of Rs.45 crore made for development of inland water transport. The Central Inland Water Transport Board, New Delhi, formulates policy for the development of inland water transport in the country.

Waterways. The Inland Water Transport Directorate of the Ministry of Shipping and Transport is responsible for the development of inland waterways. It gives technical advice to the states also. The Directorate has a regional office at Patna engaged in hydrographic surveys and marking and marking navigable channels of the rivers. A sub-office

of this regional office has been working at Guwahati since 31 March 1984.

The National Waterways (Allahabad - Haldia stretch of Ganga-Bhagirathi-Hoogly Rivers system) Act, 1982 provides that it shall be the responsibility of the Central Government to regulate and develop this waterway and to secure the efficient utilisation of this waterway for shipping and navigation. River services in the Haldia-Farakka stretch have already been introduced.

A proposal to set up Inland Waterways Authority of India for development, maintenance and management of waterways as recommended by national transport policy committee is under consideration.

The Central Inland Water Transport Corporation, a Government undertaking set up in 1967 at Calcutta, operates the river services carrying goods between Calcutta and Assam. It is also operating river services between Calcutta and Farakka, and Calcutta and Cachar. Its other activities include ship-building and ship-repairing.

118. SHIPPING IN ROUGH SEAS

Indian Shipping has been facing rough weather since 1974 when it was caught in the tidal wave of global recession in merchant shipping. India has the largest merchant shipping fleet in the third world. In shipping tonnage she ranks sixteenth in the world.

The Sixth Five-Year Plan envisaged a net acquisition of 2.5 million Gross Registered Tonnage to Indian Shipping which stood at 5.04 in GRT at the beginning of the plan period. Of this 1.33 m GRT had already been acquired between 1st April 1980 and 31 Dec. 1984. Another 1.05 m GRT had been ordered for acquisition upto 31-10-1984.

Recession. The Shipping Industry has been experiencing prolonged recession since the close of 1974, except for a brief revival during 1980-81. The shipping the world over is characterised by over-tonnaging and inadequate cargo. The technological revolution in shipping is evident from phenomenal increase in containerised cargo movement and also increase in modern fuel economy vessels. There is keen competition from non-Conference Lines in general cargo

movements in almost all trades. India is conscious of these factors and is trying to keep pace with the changed situations in shipping. As a beginning, the three major Indian lines have formed a Consortium to provide direct container services on fortnightly basis to U.K./Continent.

The share of Indian Shipping in the carriage of our overseas cargo for the year 1983-84 has been worked out at 40.85% on the basis of the information received from all Major and Minor Ports.

The National Shipping Board was reconstituted under the Chairmanship of Shri M. R. Krishna, in September, 1983. The Board had celebrated its Silver Jubilee at New Delhi on 8th May 1984.

Marine Districts. The entire coast line of India has been divided into three

Indian Tonnage

	Coastal		Overseas		Total	
	No. of ships	G.R.T. (in lakh)	No. of ships	G.R.T. (in lakh)	No. of ships	G.R.T. (in lakh)
1. Net operative tonnage as on 31-12-1983	72	3.37	333	57.55	405	60.92
2. Tonnage added from 1-1-84 to 31-12-1984	25	0.28	14	4.04	39	4.32
3. Tonnage scrapped/sold during 1-1-1984 to 31-12-1984	1	0.10	10	1.39	11	1.49
4. Net addition	24	0.18	4	2.65	28	2.83
5. Net operative tonnage as on 31-12-1984	96*	3.55	337	60.20	433	63.75

The number of ships on order on Indian and foreign shipyards as on 31-10-1984 was 47 comprising 10,35,875 GRT.

* Including 24 Off shore supply vessels

Mercantile Marine Districts, viz., Bombay, Calcutta and Madras, each under the charge of Principal Officers. Besides there are six sub-offices of the Mercantile Marine Department located at Jamnagar, Mormugao, Cochin, Visakhapatnam, Tuticorin and Port Blair, each under the charge of an Engineer-cum-Ship Surveyor.

The Mercantile Marine Departments are responsible for administration of Merchant Shipping Act, 1958 and rules and regulations made thereunder, conduct of examinations for the grant of certificate of competency to the Navigating Officers and Engineers, inspection of life saving appliances, fire appliances, installation of Radio Telegraphy/Telephonic Equipment, carriage of grains cargoes, dangerous goods, tonnage measurement of ships, their surveys and inspection for the purpose of issue of various statutory certificates, etc.

Shipping Lines. There were 70 shipping companies in the country in 1983-84 of which 17 were engaged exclusively in the coastal trade, 45 in overseas trade and the

remaining 8 both in coastal and overseas trade. The Government shipping companies viz. *Shipping Corporation of India (SCI)* and *the Mogul Line Ltd.*, carry on both the coastal and overseas trade.

The Shipping Corporation of India with an authorised capital of Rs. 100 crores and paid up capital of Rs. 70 crores incurred a loss of Rs. 51.64 crore in 1983-84 as against a loss of Rs. 24.24 crore during 1982-83. The gross earnings for the year 1983-84 was Rs. 520.5 crore as against Rs. 578.96 crore during the previous year.

SCI is one of the largest shipping lines in the world. The Corporation owns a diversified fleet comprising 154 vessels of 32.58 lakh GRT and 54.06 lakh DWT. In addition to this 27 vessels of 5.76 lakh GRT and 9.94 lakh DWT are on order in shipyards in India and abroad.

The Mogul Line Limited has an authorised capital of Rs. 25 crore and the paid-up capital of Rs. 19.01 crores.

The Company is operating Haj service, Konkan passenger service and overseas tramp service. Haj service is being operated by the company by chartering the vessel m.v. Akbar from A & N Administration and the Konkan service is run by the company with its two vessels, Konkan Sevak and Konkan Shakti. On tramp trade, 11 vessels are being deployed. The company also acts as co-ordinators of Indo-Pak Shipping Service.

The company has a fleet of 13 vessels

At a Glance

No. of sailing vessels (including mechanised) registered in India : 14300

No. of sailing vessels transactions : 1150

No. of ship casualties : 54

No. of sailing vessels casualties : 250

Shipping Tonnage Falls

The growth of Indian shipping tonnage is less during the Sixth five-year Plan (1980-85) than targeted.

It fell short by some 1.21 million gross tonnes in the operative tonnage, which totalled 6.29 million grt as on March 31 1985, against the plan target of 7.5 million grt.

The gross addition to the Indian fleet during the plan period, was envisaged at 3.4 million grt and the net about 2.5 million grt. As against this, the actual gross addition during the plan period totalled 120 vessels of 1,383,123 gross tonnes (that is 2,164,128 dwt.) The net additions after accounting for sales and scrapping of 70 ships of 633,062 gross tonne that is 930,442 dwt.) have been of the order of 50 vessels of 750,061 gross tonnes (1,233,686 dwt.)

The working group of the Planning Commission has proposed the target for shipping in the Seventh Plan (1985-90) at 10 million gross tonnes in operation and a further one million gross tonnes, expected to be on order by the end of March 1990. The gross and net additions, proposed for the Seventh Plan period, are respectively 5 million gross tonnes and 2.5 million gross tonnes (including 1.14 million gross tonnes already on order). The operational tonnage target, however, is likely to be scaled down to 8.5 million grt, with a

lower net addition of one million gross tonnes.

The statistics compiled by the Indian National Shipowners' Association (INSA) shows that the gross additions to the Indian merchant fleet during January-June, 1985 totalled 21 vessels of 227,007 gross tonnes (that is, 338,820 dwt.). The net additions after accounting for sales and scrapping of 25 vessels of 311,688 gross tonnes (488,220 dwt.) were negative and of the order of 4 vessels of 84,681 gross tonnes (154,400 dwt.)

The additions to the fleet during the period comprised delivery of 19 ships of 212,379 gross tonnes (308,956 dwt.), which were already on order and acquisitions of two second-hand vessels of 14,628 gross tonnes (24,864 dwt.). Of these, 9 vessels of 213,067 gross tonnes (317,154 dwt.) were for overseas trading and 12 vessels of 13,940 gross tonnes (16,666 dwt.) for offshore sector.

Of the total additions, about 70 percent grt was added by the state-owned Shipping Corporation of India whose fleet as on July 1, 1985 comprised 151 ships of 3.26 million grt (5.40 million dwt.) The tonnage under public sector (that is, including the additions by Mogul Line and the ministry of shipping) ownership was 3.43 million grt (5.67 million dwt.)

1.61 lakh GRT and 2.63 lakh DWT. Besides 4 vessels of 1.05 lakh DWT are on order on Indian Shipyards.

Government has taken a decision to merge Mogul Line Limited with the Shipping Corporation of India Limited and the formal merger of the two companies is expected to take place during the first half of the financial year 1985-86.

Private Companies. The major private sector shipping companies which own one lakh or more GRT are the Scindia Steam Navigation Company Ltd. (5.42 lakh GRT),

Great Eastern Shipping Company Ltd. (4.23 lakh GRT), India Steamship Company Ltd. (2.02 lakh GRT), South India Shipping Corporation Ltd. (1.51 lakh GRT), Camoder Bulk Carriers Ltd. (1.38 lakh GRT), Chowgule Steamships Ltd. (1.60 lakh GRT), Dempo Steamships Ltd. (1.38 lakh GRT) and Ratuaban Shipping Company Ltd. (1.38 lakh GRT)

Almost all the coastal trade is carried by national vessels. With the progressive normalisation of relations with Pakistan and China, trade with these countries has been resumed and Indian ships have started call-

ing at their ports. India has ratified the UN convention on Code of Conduct for Liner Conferences, which was signed by India on 14 February 1978.

Training Facilities. There are six training establishments for Merchant Navy Officers and Ratings. T. S. Rajendra at Bombay imparts pre-sea training to navigation cadets. The Lal Bahadur Shastri Nautical and Engineering College, Bombay conducts post-sea instrumental courses in navigation and engineering.

The Directorate of Marine Engineering Training at Bombay and Calcutta imparts training to marine engineering cadets. *Bhadra* at Calcutta, *Mekhala* at Vishakapatnam and *Navlakshi* at Navalakshi provide pre-sea training for deck and engineering ratings and *Bhandaries*. Training in three rating institutions has been stopped for the time being following prevailing unemployment amongst the seamen.

Register of Ships. India's national classification society - Indian Register of Shipping (IRS) - came into being in March 1975.

From a humble beginning IRS had 295 ships in its class aggregating 31.1 lakh GRT comprising 173 dual class and 122 single class vessels as on 30 April 1984. Ninety-nine vessels are being built under its single classification and 86 under dual classification.

IRS has entered into agreements of mutual co-operation with various international classification societies for technical back-up for varied services and also to carry out surveys anywhere in the world. It has been appointed by the Government as one of the assigning authorities for Load Line. It is also authorised to carry out cargo ship safety construction surveys.

With a view to augment the inadequate ship repair facilities in the country, a 15-year perspective plan for ship repair facilities in India, was drawn up in May, 1982 with the help of consultants. The recommendations of the consultants were considered by an expert group and accepted by Government for implementation in two phases: the first phase is to be completed in the 7th Plan.

Ship Building. Established in 1946 the *Hindustan Shipyard Limited* was taken over

by Government in 1952. The paid up capital of the company as on 31.3.84 was Rs. 38.38 crore as compared to Rs. 31.31 crore as on 31.3.83.

During the year 1984-85, the shipyard has laid keel for 6 vessels which includes 4 OPSSVs and 1 drill ship for ONGC. The drill ship being built at HSL is the first of its kind being built indigenously. The shipyard has already launched 3 vessels upto 31.12.84 and is expected to launch one more vessel during the current year. The shipyard has also delivered two vessels i.e. M.V. Nandrat of 27000 DWT to M/s. Essars and M.V. State of Gujarat of 16700 DWT pioneer Class vessel to Shipping Corporation of India, up to 31.12.84. The Yard is expected to deliver two more vessels during the current year.

THE COCHIN SHIPYARD project was sanctioned in 1971 and was completed in 1984. It is designed to construct ships of sizes upto 85,000 DWT and repair vessel of sizes upto 1,00,000 DWT. The rated capacity of the Yard is 1,50,000 DWT in shipbuilding and 1 million GRT is ship repair per annum on reaching optimum production.

The authorised and paid-up capital of the Company as on 31.12.1984 was Rs. 70.00 crore and Rs. 62.73 crore respectively.

The operating results of the Company showed a net loss of Rs. 10.31 crore for the year 1983-84 as against the loss of Rs. 9.68 crore for the previous year. The cumulative loss upto 31.3.1984 was Rs. 33.09 crore. The Company anticipates a loss of Rs. 12.29 crore during the current financial year.

Cochin Shipyard delivered their number three vessel, *Maratha Mission's* to M/s Chowgule Steamships Limited in March, 1985. Ship No. 004 was launched in January, 1985 and the keel of ship 005 was also laid in January, 1985.

Major Ports. A traffic of 100.5 million tonnes was handled by the Major Ports during the year 1983-84. In the current year upto Jan. 1985, the Major Ports together have handled 86.57 million tonnes against the traffic of 83.86 million tonnes in the corresponding period last year.

There are eleven major Ports in the country, Calcutta, Paradip, Visakhapatnam, Madras and Tuticorin on the East Coast and

Cochin, New Mangalore, Mormugao, Nhava Sheva, Bombay and Kandla on the West Coast. Out of these Nhava Sheva Port is at the construction stage. Development and management of these ports is the responsibility of the Govt. of India. The Indian Ports Act, 1908 provides the statutory authority for management while the Major Port Trust, Act, 1963 contains the statutory provisions for the constitution of Port Trust Boards and vesting in them the administration, control and management of the Major Ports.

In seven of the Major Ports (Bombay, Calcutta, Cochin, Kandla, Madras, Mormu-

gao and Visakhapatnam) there are Dock Labour Boards which are statutory tripartite bodies set up under the Dock Workers (Regulation of Employment) Act, 1948. In the three newer Ports of Paradip, New Mangalore and Tuticorin unified cargo handling systems are being tried. There is no operation at Nhava-Sheva.

The Ports of Bombay, Kandla, Madras, Mormugao, New Mangalore, and Tuticorin have earned surplus revenues during the past three years. However, the financial position of only Bombay, Kandla, Madras and Mormugao Ports could be considered satisfactory.

119. AIR INDIA: JOY AND SHOCK

For Air India, the nation's flag carrier, 1985 was an year of joy and sorrow. Coming just after 1983-84 when Air India earned its highest ever net profit of Rs. 57.39 crore, the year saw one of the worst disasters in its history when Jumbo jet 'Kanishka' crashed over the Atlantic with 329 passengers.

Enquiry into the cause of the accident continued over to 1986, a series of air accidents around the world gave little consolation to Air India from the fact that the year turned out to be the worst year in aviation history. Among the various theories for the cause of accidents, the latest is metal fatigue of Boeing aircrafts, corrective measures for which are sought after world wide.

Air-India, which was set up in 1953 under the Air Corporation Act, 1963, has its corporate headquarters at Bombay.

In 1983-84 the corporation made a net profit of Rs. 57.39 crore which is the highest ever earned by it and which is a considerable increase on the record profit of Rs. 38.04 crore earned in 1982-83. The Corporation's revenue in 1983-84 went up by 10.1% to Rs. 792.36 crore as compared to Rs. 719.93 crore in 1982-83. The net foreign exchange earned/saved by Air-India during 1983-84 was Rs. 180.34 crore as against Rs. 152.75 crore during the previous year. A more effective space management system on all flights and routes led to improved all round utilisation of capacity and higher average load factor.

The table below gives the financial results for the year 1983-84 and comparative figures for 1982-83.

The results for the first six months of 1984-85 show an estimated net profit of Rs. 22.80 crore. As against a total revenue of Rs. 392.66 crores during April/September 1983, the half-yearly revenue earned during the current year is Rs. 421.12 crore—the overall load factor having increased by 8.9%. Simultaneously there has been a significant increase of 22.8% in the carriage of freight.

Gulf Routes: For the first six months of 1984-85 there was a 7.2% increase in the revenue of Air-India. This period, however, also witnessed certain developments in the Gulf route which have had an adverse bearing on the operating results of the Corporation. The decline in world oil prices and slowing down of construction and econo-

Air India at a Glance

	1983-84	1982-83
	(Rs. in crore)	
Operating Revenue	779.55	700.88
Operating Expenses	692.43	639.38
Operating Profit	87.12	61.50
Non-Operating Revenue	12.81	19.05
Non-Operating expenses	42.54	42.51
Net Profit	57.39	38.04

Platinum Jubilee

The Platinum Jubilee of Aviation in India was celebrated from Dec. 6 to 9, 1985 at a colourful function in Bombay.

Flying demonstrations, aero-modelling, gliding, hand-gliding and flying-past by Naval and Bombay Flying Club aircraft, heralded the celebrations which featured the development of Indian aviation through the last 75 years.

Union Minister of State for Civil Aviation, J. Jagdish Tytler, who opened the celebrations at Juhu air-port, said that the nation will be genuinely proud of the glorious past through which Indian aviation came to become one of the foremost in the world. Union Minister of State for Surface Transport, Rajesh Pilot, who presided over the valedictory function at the Air India Auditorium, exhorted to keep up the Maharaja image of India's national carrier unstinted.

mic activities has resulted in a recessionary situation there. In consequence, 1984 has seen a gradual cut-back in the development expenditure budgets of Gulf countries and an inevitable slowing down in the movement of worker traffic between India and the Gulf.

Present Fleet. The aircraft fleet of the Corporations as on 31st December, 1984 consists of: i) Ten Boeing 747-237 aircraft; ii) Five Boeing 707-337 aircraft; iii) Three Airbus A300-B4 aircraft.

Air-India has placed a letter of Intent on Airbus Industries for acquisition of six Airbus A310-300 aircraft, at an estimated cost of Rs. 531.78 crore including a foreign exchange component of Rs. 478.98 crore. The acquisition will, however, be subject to approval of the Central Government.

Indian Airlines was set up under the Air Corporations Act, 1953 with an initial capital of Rs. 3.25 crore with its Corporate Headquarters at Delhi. It has four Regional offices which are located at Bombay, Calcut-

ta, Delhi and Madras. Its functions are to provide air services for passengers, cargo and mail on the internal air network of the country including adjacent countries, i.e. Afghanistan, Bangladesh, Sri Lanka, Maldives, Nepal and Pakistan.

Indian Airlines carried 7.699 million passengers in 1983-84. During 1984-85 IA introduced 12 new services, of which the important ones are the following:

Calcutta-Bangalore; Delhi-Goa-Cochin-Trivandrum; Delhi-Varanasi-Raipur; Bombay-Coimbatore-Bombay; Dibrugarh-Tezu; Kanpur-Patna.

Out of this fleet, two F-27 aircraft are on lease to Coast Guards. Indian Airlines had also leased some capacity of A300 B4 aircraft to Air-India for operation of their services to the Gulf. F-27 and HS-748 capacity has been provided for operating Vayudoot services in the North Eastern and Northern Region respectively on lease basis.

Profits Up. The year 1983-84 ended in the Corporation earning the highest ever Operating Profit of Rs. 90.71 crore and the highest ever net profit of Rs. 45.85 crore since its inception in 1953. It also witnessed a substantial increase in passenger and cargo traffic. This performance has been achieved by exercising management control through meticulous monitoring of activities in all disciplines with emphasis on judicious scheduling of flights.

With effective monitoring of activities, the performance of the Corporation continued to improve during 1984-85 also. Indian Airlines made a profit of Rs. 44.76 crore during April '84 to February '85 as compared to Rs. 27.87

IA Financial Position

Particulars	April 84 to Feb 85
	(Rupees in Crore)
i) Operating Revenue	541.81
ii) Operating Expenses	454.01
iii) Operating Profit	87.80
iv) Non-Operating Revenue	14.82
v) Non-Operating Expenses	57.86
vi) Net Profit	44.76
vii) Foreign Exchange Earnings	132.09

* of these 'Emperor Kanishka' crashed over the Atlantic in 1985

crore during the corresponding period in the previous year.

Vayudoot. The third Airline, was incorporated in January, 1981 to connect inaccessible areas of the North-East region and stations not served by the Indian Airlines which are important as centres of trade and commerce or from the point of view of tourism. Vayudoot was initially incorporated as a private limited company. Subsequently on 17-2-1983 it was converted into a public limited company.

The company was incorporated with an authorised capital of Rs. 25 crore with an initial paid up capital of Rs. 1 crore. The present total subscribed capital of the company is Rs. 6.5 crore contributed equally by Air-India and Indian Airlines.

Till December, 1984 Vayudoot was operating on ten routes. During the month of June, 1984 the service on the Chabua-Tezu-Chabua sector was discontinued and Indian Airlines started operating on it, in keeping with route rationalization between the two Airlines. Operations to Calcutta-Aizawl-Silchar and back were suspended due to deterioration of runway at Turial Air field (Mizoram).

Vayudoot had sustained a net loss of Rs. 109.27 lakh during the year 1982-83, but it improved its operational and financial performance and achieved an overall profit of Rs.3.72 lakh during the year 1983-84.

Directorate General. Headed by the Director General of Civil Aviation with headquarters at New Delhi it has its regional offices at Bombay, Calcutta, Delhi and Madras.

As on 31st October, 1984, there were 85 aerodromes and 23 civil enclaves under the control of the Director General of Civil Aviation.

In addition to Air-India and Indian Airlines, Vayudoot operates within India to 11 civil aerodromes, 1 civil enclave and 2 licensed private aerodromes.

16 Private operators held permits for operation of non-scheduled air services.

During the year 1983-84, a number of 10,270,106 passengers and 1,90,779 tonnes of freight (estimated) were carried on scheduled services (both international and

domestic) by Air-India and Indian Airlines. The percentage of increase in 1984 over 1975 was 167.46% for passengers and 53.90% for freight carried—tremendous progress in 10 years.

Airports Authority. The International Airports Authority of India, which was set up in 1972, is responsible for providing efficient air transport services at the four international airports viz. Bombay, Calcutta, Delhi and Madras, except provision of Air Navigational services which continue to be

IA to get 31 Airbus

The Indian Airlines has decided to purchase 31 164-seater wide-bodied Airbus-320's to meet growing traffic requirements.

A letter of intent has been delivered to the Airbus Industrie general manager and most of the aircraft will be ready for delivery in the second half of 1988. The high technology advanced version incorporates some of the most advanced aviation technology and the fly-by-wire system is to be introduced.

The total cost of the order will be around Rs. 1,500 crore, to be raised by Indian Airlines from its own resources.

As far as immediate requirements of Indian Airlines are concerned, for meeting the 12.5 per cent increase in passenger traffic, Airbus Industrie will lease out 12 aircraft, a mix of Airbus A-300 and Boeing-737s on a no-cost basis.

The selection of the Airbus-320 brings to a close an arduous process of nearly a year of evaluation of cost, technology and passenger comfort offered by the competing bidders, the European consortium of Airbus Industrie and Boeing Company in the U.S.

Indian Airlines experts, who made an in-depth study of the Airbus-320 and Boeing-757, considered the Airbus more fuel-efficient. It will be fitted with the new technology engines manufactured by the American-European conglomerate which also has Japanese participation.—

[PTI: September 27, 1985]

the responsibility of the Department of Civil Aviation.

The net profit of the Authority for the year

1984-85 is estimated to be of the order of Rs.17.93 crore as against Rs. 15.85 crore during the previous year 1983-84.

Kanishka: Fifth Costly Craft

The book value of Emperor Kanishka which perished in the mid-air mishap on the Irish Coast on June 23, 1985, is put at Rs. 34.68 crore and in terms of value of aircraft, it ranked fifth among the Boeing 747's and eighth among all the aircraft of Air-India.

Among the Boeing 747s, the highest valued (Rs. 40.85 crore each) were Emperor Harsha Vardhana and Emperor Mahendra Verma followed by Emperor Krishna Devaraya (Rs. 38.36 crore), Emperor Samudragupta (Rs. 38.34 crore) and Emperor Kanishka (Rs.34.68 crore) in that order. The cost of the Air Bus aircraft, A 300 B4 is however, substantially more than that of Boeing 747.

Boeing 747's constitute the largest segment of Air-India's aircraft from the angle of both value and number. Out of the cost of Rs. 473.6 crore pertaining to 19 aircrafts of Air-India ten Boeings, including Kanishka, accounted for Rs. 307.62 crore or 65.0 per cent. Airbus aircraft 'Cauvery' was valued at Rs. 48.08 crore followed by Airbus Godavari (Rs. 45.07 crore) and Ganga (Rs. 44.94 crore). (Table

Value of Aircraft

Sl. No.	Type of Aircraft	(Rs. crore)
AIR-INDIA		
	BOEING 707s	
1.	Nangaprabhat	3.11
2.	Dhaulagiri	3.39
3.	Lhotse	3.88
4.	Annapporna	5.60
5.	Kamet	5.87
6.	Trishul	6.05
	Average	4.65
	BOEING 747s	
7.	Emperor Shahjahan	18.37
8.	Emperor Rajendra Chola	
9.	Emperor Vikramaditya	17.92
10.	Emperor Akbar	17.96
		27.75
11.	Emperor Chandragupta	32.54
12.	Emperor Kanishka	34.68
13.	Emperor Krishna Devaraya	38.36
14.	Emperor Samudragupta	38.34
15.	Emperor Mahendra Verman	40.85
16.	Emperor Harsh Vardhana	40.85
	Average	30.76
	AIR-BUS A 300B4	
17.	Ganga	44.94
18.	Godavari	45.07
19.	Cauvery	48.08
	Average	46.03

SOURCE: *Rajya Sabha Question No. 1558 answered on March 15, 1983.*

120. COMMUNICATION

India's communication network is one of the largest in the world. Nearly 1.5 lakh post offices serve more than 120 million homes spread over 22 states and 9 Union Territories. There are nearly 37,000 telegraph offices and 35 lakh telephone sets. In spite of the rapid expansion, the number of applicants waiting for telephone connections is not less than 8.5 lakhs.*

The postal system, as we know it, was started in India by the East India Company. The first postage stamp was issued in Karachi in 1852. It was valid only in the

* For Communication Revolution in India see Special Feature of Part Three

Province of Sind. In 1854, the company constituted the Postal Service as a separate entity under a Director General and issued a postage stamp, on all-India basis. The first telegraph line was put up in India in 1853. It extended from Calcutta to Agra. The Posts

and Telegraph system received statutory recognition under Act VI of 1898.

Growth of P and T. In 1864, there were 211 major and 451 minor post offices in the country, almost all of them confined to cities and major towns. They handled some 12 million postal articles a year. At the time of independence, on Aug. 15th, 1947, there were 22,116 post offices of various types in the country. Since independence, a systematic attempt has been made to see that every village in India had postal facilities.

From January 1985 the Ministry of Com-

munications has been bifurcated into two Departments: (1) Department of Posts and (2) Department of Telecommunications. Each Department is headed by a Secretary to the Government of India. The Secretary (Telecommunications), who is overall incharge is assisted by an Additional Secretary (Telecommunications) and an Additional Secretary and Financial Adviser (Telecommunications) in regard to his functions and responsibilities for the wing comprising (i) Wireless Planning and Co-ordination, (ii) Overseas Communications Service (iii) Monitoring Organisation, (iv) Indian Telephone Indus-

One Post Office for 5100

- *The number of Post Offices in the country rose to 1,44,719 during 1983-84. There is an average of one post office for 5,100 (figures based on July, 1983 projected population by ESCAP) people and for an area of 21.87 sq. km.*
- *The Posts and Telegraphs provides deliveries to 3.3 crore addresses and handles more than 3.8 crore letters and parcels each working day. The mail is collected from over 5 lakh letter boxes as well as from post offices and large postal users.*
- *The total number of telegraph offices rose to 36,953 from 35,890. A small rise in the number of inland telegrams was also recorded as the telegrams booked in 1983-84 stood at 769 lakh as against the previous year's figure of 753 lakh.*
- *There was a net addition of 2.02 lakh Direct Exchange Lines (DELs) bringing the total to 26.67 lakh. During 1983-84 690 new telephone exchanges were opened bringing the total Departmental Exchanges in India to 9,978.*
- *26,100 lines were commissioned in Trunk Automatic Exchanges (TAX) during the year by opening 4 new Electronic Trunk Automatic Exchanges at Bombay, Delhi and Madras. 11 more STD routes on point-to-point basis were added during the year bringing the total number of such routes to 201 at the end of March, 1984*
- *The country has 176 telex exchanges. Total telex capacity increased to 29,844 local lines and 9,500 transit lines. At the end of the year total telex connections stood at 22,527.*
- *Direct telephone service is available with 44 countries of which 42 countries are connected through satellite circuits. Subscribers at the metropolitan cities e.g. New Delhi, Bombay, Madras and Calcutta can dial subscribers in United Kingdom, Australia, Singapore, Hong Kong, France and Japan on fully automatic basis.*
- *Fully automatic service is available to Indian telex subscribers through Gatex Bombay, Delhi and Madras. They can establish their telex calls to 101 countries without any operator assistance.*
- *The Post Office Savings Bank maintained the position as the nation's largest savings bank with about 1,44,000 post offices and an aggregate investment of Rs. 13,524 crore as compared to 11,111 crores in 1982-83.*
- *During the year, 1,17,473 new policies were issued of a total sum assured of Rs. 143.03 crore. The number of policies in force as on 31-3-1984 was 10,84,172 and value of business was Rs. 809.42 crore both registering a growth of 7.67% and 31.88% respectively over the figures of the preceding year*

tries Limited and (v) Hindustan Teleprinters Limited.

Postal Services. During the year 1983-84 the development of Postal Services continued satisfactorily till December, 1983 in line with the targets but some shortfall in achieving the targets had to be there due to imposition of ban on creation of new posts. In all, 2,268 extra-departmental Branch Post Offices were opened in the rural areas out of which 541 were in tribal and 329 in backward areas.

The total number of post offices in the country as on 31-3-1984 was 1,44,719 (15,325 in urban areas and 1,29,394 in rural areas). The average area and the population served per post office were 21.87 sq. km. and 4,734 respectively.

In addition, 1,680 more villages were provided with mobile counter service facilities during the year. The total number of villages provided with mobile service at the end of the year stood at 70,020.

For strengthening the arrangements for daily delivery of mails and clearance of letter boxes in rural areas, 1,546 extra-departmental delivery agents were appointed during the year. 928 additional letter boxes were also planted in the rural areas. The total number of letter boxes in the country as on 31-3-1984 was 4,99,310 out of which 74,979 were in urban and 4,24,331 in rural areas.

Growth of Traffic. The postal traffic continued to show steady growth. In the year 1982-83, the postal services handled nearly 1,085 crore pieces of mail, excluding money orders. There was a growth of nearly 53 crore in the year, the figure reaching 1,138 crore pieces of mail handled. The growth in the traffic of registered articles was 5.5% against 5.2% in the previous year. The total number of registered articles handled in the year was 2,888 lakh. Newspapers and periodicals still form a sizeable chunk of the total volume of mail.

Nearly 1,273 lakh inland money orders of the total value of Rs. 1,679 crore were issued; the commission realised on money orders was Rs. 47.7 crore; the average value of a money order was Rs. 131.95 (previous year's average—Rs. 125.52).

Returned Letter Offices. Returned Letter

Offices (RLO) situated at different places in the country handled about 317 lakh pieces of mail having insufficient or illegible addresses. The staff could successfully locate the addresses and the senders in 54.55% and 24.68% cases respectively, the total percentage of success being 79 (approximately). Valuables worth Rs. 246 lakh were directed to the correct addresses or restored to their senders.

The Departmental *Mail Motor Service* functioned at 87 stations in the country during the year 1983-84. During the year 19 additional vehicles were purchased and pressed into service for efficient conveyance of mails in the country. Departmental Mail Motor Service was also introduced at the following stations in the country during 1983-84.

Quilon in Kerala Circle, Ambala in N.W. Circle, Tuticorin in Tamil Nadu Circle and Itanagar/New Itanagar and North Lakhimpur—in the North Eastern Circle.

Philately. Posts and Telegraph Dept issued 37 stamps, presenting in themselves a judicious blend of various trends. Thus, while international personalities like St. Francis of Assisi, Karl Marx, Charles Darwin and Simon Bolivar were honoured and themes like World Communications Year, Commonwealth Heads of Government Meeting, Bi-Centennial of Man's First Flight were portrayed on the stamps.

Indian personalities like Mahadeva Desai, Mira Bahen, Ram Nath Chopra, Krishan Kant Handique, Hemu Kalani, Vinoba Bhave, Surendra Nath Bannerjee and Vasudev Balwant Phadke, and Indian themes like Struggle for Freedom, Indian Mountaineering Foundations, Bombay Natural History Society, Rock Garden Chandigarh, Ghats of Varanasi, and the Asiatic Society have also found a place on our stamps.

In addition, themes like Children's Day, Wild Life, Indian Painting, Postal Life Insurance, and Defence Forces too have not been ignored. The Stamp pad for the year presents a varied and colourful picture of Indian life in the international context with the traditional background.

Five new Philatelic Bureaux were opened at Panaji (Goa), Dehradun, Bhubai, Imphal and Kohima bringing the number of Philatelic

Bureaux and Counters to 43 and 132 respectively.

India is a member of the Universal Postal Union (a specialised agency of the United Nations) comprising 167 member countries and the Asian Pacific Postal Union (a Restricted Postal Union) with a membership of 19 countries. India continues to be closely involved in the work of these two international postal organisations.

Savings Bank. The Post Office Savings Bank maintained its position as the nation's largest Savings Bank with about 1,44,000 post offices (1,29,000 in rural areas) providing service throughout the country.

On 31-3-84, the aggregate investment in all forms of National Savings amounted to Rs. 13,524 crore, as compared to Rs. 11,111 crore in 1982-83, registering an increase of Rs. 2,413 crore. These investments, except for Rs. 4,571 crore lying in Savings Certificates, are held by 658 lakh depositors in Savings, Cumulative Time Deposit, Recurring Deposit, Time Deposit, Fixed Deposit and Public Provident Fund accounts.

The limit for instant withdrawal at the counter without the transaction having to pass through the supervisor was raised to Rs. 500 from Rs. 300 with effect from 1-1-84.

Extra-Departmental sub and branch post offices were authorised to accept cheques for deposit with effect from 10-6-83.

The facility of withdrawal by cheque in savings accounts was extended to minor accounts operated by guardians on their behalf with effect from 9-1-84.

Telecommunication. The number of telegraph offices rose to 36,953 in 1983-84 from 35,890 in the previous year. At the end of the year, there were 492 Departmental Telegraph Offices, 33,842 Combined Departmental Telegraph Offices and 2,619 Licenced Telegraph Offices working under the Railway and Canal administrations.

Also, there were 3,033 Licenced Telegraph Offices working exclusively for the use of Railway and Canal administrations. Thus, the total number of all types of telegraph offices, as on 31-3-1983, stood at 39,986.

Seven hundred and sixty-nine lakh inland telegrams were booked during the year

30 Lakh More Phones

Thirty lakh more telephones would be provided by 1990 for which an outlay of Rs. 1,200 crore has been earmarked in the Seventh Plan, Thomas Kora, Secretary of the Union Ministry of Communications said in Sept. 1985.

Eight-and-a-half lakh people were already waiting for telephone connections with the demand continually soaring, he said while commissioning a Rs. 62.5 lakh 200-line Max II telephone exchange, at the Valiamala complex of the Vikram Sarabhai Space Centre, 25 km from Trivandrum.

The exchange has 60 channels providing direct access to all the stations through a micro-wave tower erected at the 80 hectares complex for its exclusive use.

Kora said in the Seventh Plan about Rs. 4,010 crore had been allocated for telecommunication. The number of telephones had risen from 18,000 at the time of independence to 34 lakh now. Even then, it was still far short of the demand.

(PTI: Sep. 27, 1985)

(previous year's figure 753 lakh), of which 10.2% were on state business and 1.1% on press business.

About one hundred and forty lakh messages were booked and 27.6 lakh were communicated over the phones.

About sixty-nine lakh greeting telegrams were transmitted during the year. Of these 0.80 lakh were deluxe telegrams.

The number of telegraph offices which provided this service was 14,953 on 31-3-1984.

Telephone Systems. The switching capacity in the country reached 30.53 lakh lines with the addition of 2.26 lakh lines during 1983-84. There was also a net addition of 2.02 lakh direct exchange lines bringing the total direct exchange lines to 26.67 lakh.

Six hundred and ninety new telephone

exchanges were opened during the year bringing the total number of departmental telephone exchanges in India to 9,978.

Twenty six thousand one hundred Trunk Automatic Exchange (TAX) lines were commissioned during the year by opening four new electronic trunk automatic exchanges at Bombay, Calcutta, Delhi and Madras together with expansion of existing exchanges. As on 31st March, 1984, there were 28 trunk automatic exchanges in the country with equipped capacity of 80,620 lines. 32 additional stations were connected to the TAX network during the year bringing the total number of stations connected to the TAX network to 237.

11 more subscribed trunk dialling (STD) routes on point-to-point basis were added during the year bringing the total number of such routes to 201 at the end of March, 1984. Besides, 233 manual trunk switching boards were installed and 2,380 trunk circuits were added to work on the manual trunk board for handling the trunk traffic. A total of about 2 lakh lines of digital electronic switching equipment is likely to be commissioned in the coming years.

International Service. Direct telephone services is available with 44 countries of which 42 countries are connected through satellite circuits. Switched telephone service is available to almost all the countries of the world. Subscribers at the Metropolitan cities e.g., New Delhi, Bombay, Madras and Calcutta can dial subscribers in U.K., Australia, Singapore, Hongkong, France and Japan on fully automatic basis.

The International Trunk Exchange operators at New Delhi, Bombay, Calcutta, Madras, Ahmedabad, Bangalore, Chandigarh, Ernakulam, Hyderabad, Indore, Jaipur, Jalandhar, Lucknow, Ludhiana, Madurai, Panjim, Pune, Surat and Trivandrum can dial subscribers in 94 countries on semi-automatic basis.

Semi-automatic telephone service is available between India and Sri Lanka and between India and Nepal over P&T Microwave link. Manual telephone service is available between India and Pakistan, Bangladesh, Nepal, Sri Lanka and Bhutan over P&T terrestrial links.

International manual telephone traffic dur-

ing 1983-84 has been of the order of 19.7 lakh effective calls.

Gateway Switching Systems (GSSs) for telephone working are available at New Delhi, Bombay and Madras to provide additional international telephone circuits and extension of International Subscriber Dialling (ISD) to other countries.

Fully automatic service is available to Indian telex subscribers through Gatex Bombay, Delhi and Madras and they can establish their telex calls to 101 countries without any operator assistance. In addition, operator assisted service is available through MSP at Delhi, Bombay and Madras and manual revertive telex Service is available through in-telex at Delhi, Bombay, Calcutta and Madras.

Rural Communication. To improve the telecommunication facilities in rural, backward, hilly desert areas the P&T Department has embarked upon the scheme to provide Digital Equipment in the secondary areas throughout the country.

To start with, 20 secondary areas were selected for the introduction of integrated Digital Network (IDN) which envisages provision of Electronic Terminal Exchanges, connected through one or more transit Switches and Pulse Code Modulation Systems on Radio or Cable.

The IDN scheme will make a start in the first year of the 7th Plan.

Pin Code. As from August 15, 1972, which marked the Silver Jubilee of independence the postal department introduced a new system, the *Postal Index Number* (PIN) code to facilitate the despatch and delivery of mail. Under this system numbers replace names of post offices in addresses. For the present, however, names are also retained along with numbers, so that the public may be saved unnecessary confusion.

The code is a six-digit number, where the first digit stands for a postal region or zone. There are 8 postal regions in India. The second and third digits stand for a sub-area in the region and the last three digits show the particular post office of delivery. Take for instance the PIN code for Kottayam-686 000. Here 6 stands for the region, that is, Kerala and Tamil Nadu States, of which Kottayam division is a part.

The 2nd and 3rd digits 86 stand for Kottayam sub area. All postal offices in Kottayam division will have the common prefix 686. This is followed by 3 digits which indicate what the delivery post office is. 686 000 does not indicate any post office but

686 001 represents what was previously known as Kottayam-1, that is the Kottayam Head Post Office. 686 002 will represent the delivery office previously known as Kottayam 2, that is, the Collectorate Post Office in Kottayam, and so on.

121. TELEVISION'S JUBILEE JUMP

Doordarshan, India's television network, is 25 years old. During the silver jubilee year the network carried out an expansion that has, perhaps, no parallel in any developing country. Starting with 45 transmitters Doordarshan ended the year 1984-85 with a total of 171 transmitters. Like T.V., Akashvani also is on the threshold of a jump—with a number of FM radio stations added to its network.

Television was introduced in the country in September, 1959 by setting up a centre at Delhi with the aid of UNESCO. In the initial years, transmission was limited to Delhi and adjoining rural areas and the rural viewers were provided with community viewing sets funded by the Ford Foundation. Over the last 25 years, Doordarshan has expanded both its network and the scope of its activities and has crystallised its main objectives.

Expansion. During its Silver Jubilee year, Doordarshan carried out an expansion of its transmitter network which has perhaps no parallel in any developing country. At the beginning of the year, there were 45 transmitters in the network with 7 full-fledged Kendras, 3 smaller Kendras and 3 Production Centres. The network provided service to about 28 per cent of the population. In July, 1983, Government approved a Special Plan for TV Expansion at an outlay of Rs. 68 crore.

The Plan envisaged establishment of high power (10 KW) transmitters (HTPs) and low power (100 Watt) transmitter (LPTs) in various parts of the country, including some important project areas, so as to raise the total number of transmitters in the network to 180 by the end of the Sixth Plan. With the implementation of this Plan, Doordarshan added an unprecedented number of 126 transmitters to its network during the year.

Beginning July 1, 1984 one transmitter was commissioned every day for a period of about four months. All equipment required for the Special Plan was manufactured indigenously by public sector undertakings

viz., Bharat Electronics Ltd, Electronics Corporation of India Ltd, Gujarat Communications and Electronics Ltd and Triveni Structures Ltd.

Many equipments were developed for the first time in the country. At present all the transmitters set up under the Special Plan, relay programmes from Doordarshan Kendra, Delhi via INSAT-IB. Among the Sixth Plan schemes approved earlier, interim programme production facilities were commissioned at Trivandrum.

Transmitters at Murshidabad, Asansol and Guwahati were commissioned on full power while interim service on reduced power was made available at Ahmedabad, Trivandrum, Kasauli, Varanasi, Kodaikanal, Panaji and Vijayawada. Doordarshan now has 172 transmitters in the network, providing TV service to 52 per cent of the population.

A major plan for expansion of TV service in the north eastern region has also been approved by the Government at an outlay of Rs.36.43 crore. The plan envisages setting up (i) 10 KW transmitters at Silchar, Dibrugarh and Tura; 1 KW and LPTs at six additional places and (ii) limited programme production facilities at all places where 10/1 KW transmitters are being established as well as a programme production and feeding centre at Guwahati.

All the transmitters in the region will be able to relay not only the national programme from Delhi but also community programmes for the region from Guwahati. In addition, limited local programme service will be

available at the eight places mentioned above. With the implementation of this plan 80 per cent of the population in this region will receive TV service. Transmitters and other necessary equipment for the plan were ordered during the year and other actions are in progress.

Second Channel. The year also marked the beginning of multi-channel TV service in the country. On September 17, 1984, the then Prime Minister, Smt. Indira Gandhi inaugurated the second TV channel of Doordarshan Kendra, Delhi. At present, programmes of interest to the viewers of the metropolis are put out on this channel for two hours every evening. Proposals for commissioning similar second channel TV service at Bombay, Madras and Calcutta are under consideration of the Government.

With the phenomenal expansion of the network as well as increase in transmission hours, the need for augmentation of software generation capacity has increased. In view of this, steps were taken to provide additional electronics news gathering equipment (ENG) to all Kendras to facilitate production of field-based programmes, including wider coverage of news-worthy events.

The basic thrust of Doordarshan's Seventh Plan proposals is to provide a three-tier TV service comprising (i) primary service in each major state to be available throughout the State in the language of the state, (ii) national service to be available throughout the country based on programmes produced at Delhi as well as programmes of national relevance originating from other centres and (iii) local service for a limited duration from the primary service transmitters with provision for separate channels at the metropolitan centres.

The Seventh Plan proposals, *inter alia*, also envisage wider availability of facilities for local programme production in each state/Union Territory as well as more intensive TV coverage of the border areas.

INSAT Utilisation. Following the success of the SITE (Satellite Institutional Television Experiment) 1975-76, Government approved a proposal for multipurpose Indian National Satellite (INSAT). One of the objectives of the INSAT System was to provide

nationwide direct TV broadcasting to rural communities in the fields of education, social awareness, health and family welfare, rural development, etc. The other objective was to use INSAT for relay of television programmes (National Networking) by a large number of terrestrial transmitters which do not have any facilities for production of programmes.

Under the INSAT schemes a cluster of three districts each in Andhra Pradesh, Bihar, Gujarat, Orissa, Maharashtra and Uttar Pradesh were proposed to be provided, by rotation, area specified programme of 40 minutes in the evening and educational programmes of 45 minutes duration during the forenoon.

Besides the 20 LPTs that were brought up before the Asian Games in 1982, the LPTs and HPTs that have been or are being set up under the Special Plan for TV Expansion would relay television programmes through INSAT.

Limited programme production facilities were also proposed to be provided at Nagpur, Ranchi, Rajkot and Gorakhpur and the then existing facilities at Hyderabad and Cuttack augmented for production of field-based area specific programmes.

Extension. Interim TV service at Nagpur commenced on August 15, 1982. During the year the transmitters at Gorakhpur and Ranchi were commissioned. Interim service was also started at Rajkot. Programme production facilities were commissioned at Gorakhpur, Ranchi and Rajkot. Telecast of area-specific and educational TV programmes was started in Uttar Pradesh, Bihar and Gujarat thus completing the provision of area specific and educational TV service in all the six states.

The relay of educational programmes in Hindi for Uttar Pradesh and Bihar was extended to the relay transmitters in these as well as other Hindi-speaking states like Madhya Pradesh, Rajasthan, Haryana, etc. Similarly, INSAT-based relay transmitters in Andhra Pradesh, Orissa, Bihar and Uttar Pradesh also started telecasting the area specific programmes in the evening.

From August 15, 1984, a one-hour programme on higher education is being telecast every afternoon over the entire network.

These programmes are provided by the University Grants Commission.

About 800 direct reception (DR) and 150 VHF (very high frequency) community viewing TV sets had been earlier deployed in the selected areas of Andhra Pradesh and Orissa and within the service area of TV transmitters, Nagpur. In addition, 50 direct reception sets were installed in Maharashtra and about 100 VHF sets in Gujarat. Installation of remaining sets is in progress.

National Programme. To keep the viewers informed about the cultural, social and economic progress in various parts of the country, to bring home the message of unity in diversity and promote a spirit of national integration in the country, a national programme was introduced for simultaneous telecast by all transmitters with effect from August 15, 1982.

The programmes are produced at various centres and include items on national integration, communal harmony, family welfare, India's cultural heritage including art, music and dance, world literature including India's contribution and India's struggle for independence as well as programmes on science and news and current affairs. An element of light entertainment is also included within this broad spectrum.

The duration of the national programme was increased with effect from April 15, 1984 which enabled longer news bulletins in Hindi and English. The national programme is now telecast from 9.00 to 10.40 p.m. with a 20-minute Hindi news bulletin at 9.00 p.m. and a 20-minute English bulletin at 9.50 p.m.

Beginning August 15, 1984, specially produced films on various facets of our freedom struggle were telecast in the national programme every fortnight. These included films produced by the Films Division and programmes produced by Doordarshan Kendras.

News and Current Affairs.

News and Current Affairs programmes continued to be telecast to create among the viewers better understanding of major events and developments in the country and abroad. The increased duration of the two national news bulletins in Hindi and English enabled wider coverage of national and international events.

Rs. 600 million from Commercials

At the present level of television commercials, Doordarshan will earn more than Rs. 600 million as advertisement revenue for 1985-86, a survey has revealed.

In May alone Delhi TV and the national network carried 1,004 commercials worth Rs. 37.8 million, according to the survey by the Baroda-based Operations Research Group (ORG) which has been conducting studies on TV programmes and commercials on a continuous basis.

The survey has revealed that unlike in the case of the Press and Radio, food products and soft drinks are being advertised more frequently on television than any other product groups contributing 43 per cent of Doordarshan's total revenue.

The survey finds that 80 per cent of the advertisements are in colour indicating that advertisers have shifted to colour much faster than it was expected when colour was first introduced on TV.

Half the total revenue from commercials was from Hindi serials while Hindi feature films and Chitrahars put together "hardly attract one-third of total TV advertisements".

The survey says that 35 per cent of all commercials were on sponsored basis and 10 companies put together accounted for most of the commercials.

[PTI: October 7, 1985]

The visual content of both the bulletins was enriched further by getting visual feeds on news-worthy events from different Kendras as well as abroad. During the year Doordarshan started getting visuals on international events from VISNEWS directly via Satellite. From November 1, 1984 Doordarshan also became a member of Asian Vision enabling it to receive direct satellite feed of news stories from the member countries of Asia Pacific Broadcasting Union. This also enables Doordarshan to send news stories to the TV networks of other Asian countries.

Hours Increased. There was considerable increase in the total transmission hours of Doordarshan Kendra, Delhi. The Kendra now telecasts programmes upto 11.30 p.m. daily. On Sundays, the Delhi Doordarshan commences at 9.30 a.m. and goes on till 11.30 p.m. except for a short break of about 45 minutes during the afternoon. All the relay centres linked to Delhi via INSAT relay these programmes.

The Sunday morning transmissions of Delhi are also relayed partly or fully by several major Kendras like Bombay, Calcutta, Srinagar, Lucknow, Jalandhar, etc. In addition, Delhi puts out morning transmission from 9.00 to 11.30 a.m. on second Saturdays which are relayed by all INSAT-linked relay transmitters and also by Jalandhar, Jaipur, Raipur, Muzaffarpur, etc.

With the availability of colour OB (Outside Broadcasting) vans, the proportion of programmes in colour increased considerably at Delhi, Bombay, Calcutta and Jalandhar. In addition, a number of ENG cameras and associated equipment had been deployed earlier at various programme producing Kendras. This helped improve the capacity for production of field-based programmes in colour. During the year, steps were taken to improve the availability of studio facilities at Delhi by modification of some existing accommodation.

Sports. Coverage of sports received considerable attention throughout the year. The most significant international sports event 1984 was the Olympic Games held at Los Angeles, USA. For the first time, Doordarshan arranged live telecast of the opening and closing ceremony of the Games. In addition to the live telecast of hockey matches played by India, 100 minute capsules of daily highlights of various events were brought to the viewers all over the country.

Among other noteworthy international events covered by Doordarshan were Wimbledon Tennis Finals, U.S. Open Tennis Finals, Uber Cup and Thomas Cup Badminton Finals, South Asian Federation Games, international Athletic Meet, etc.

The year witnessed a very busy cricketing season. Doordarshan provided live coverage to the India vs. Australia series, India vs.

England series as well as India vs. Pakistan series played in Pakistan. Highlights of some of these cricket matches were separately telecast as sponsored programmes.

The important national sports events covered by Doordarshan included Federation Cup Football, Beighton Cup Hockey, National Hockey Championship, Grandprix Table Tennis, Nehru Memorial Cup Football, National Equestrian Championship, National Kho Kho-National Judo Championship, Master Tennis Tournaments etc.

Commercial Service. Commercial service of Doordarshan was started in January, 1976 from 7 Kendras at Delhi, Bombay, Calcutta, Madras, Jalandhar, Lucknow and Srinagar. Commercial service from Hyderabad was started in December, 1983. Commercial service from Doordarshan Kendra Bangalore is expected to be started shortly.

The revenue from commercials continues to increase over the years. During 1982-83 an amount of Rs. 15.89 crore was earned while during 1983-84, the earnings went up to Rs. 19.79 crore. Upto November, 1984, the earnings, were Rs. 18.84 crore and it is expected that during 1984-85 the earnings would touch Rs.30 crore.

The largest number of commercials were booked with Hindi feature film and Chitrahaar programmes. Other programmes of Doordarshan which attracted commercials include plays, Saptahiki, Aap ke Liye, Krishi Darshan, sports and quiz programmes, children's programmes, regional films etc.

The scheme of sponsored programmes was introduced in 1983 enabling various organisations, business houses etc. to sponsor either programmes produced by them or imported programmes or programmes produced by Doordarshan.

Serial programmes like 'Hum Log', 'Yeh Jo Hai Zindagi', 'Anveshan', etc., attracted sponsorship. Sports programmes, particularly the coverages of the Olympic games and some test-cricket matches were also sponsored.

TV Centres on March 1, 1985.

Assam: HPT Centre: Guwahati. LPT Centres: Dibrugarh* Tezpur, Silchar* Under implementation: LPT Centres: Jorhat, Diphu.

Andhra Pradesh: HPT: Hyderabad, Vi-

jayawada. LPT: Warangal, Kakinada, Visakhapatnam*, Rajamundry, Nellore, Nizamabad, Kurnool, Anantapur, Tirupati, Adoni, Cuddapah, Mehboobnagar, Karimnagar.

Bihar: HPT: Patna, Muzaffarpur, Ranchi. LPT: Dhanbad, Jamshedpur, Gaya, Bhagalpur, Munger, Purnea. Under implementation: Darbhanga, Bettiah.

Delhi: HPT: Delhi.

Gujarat: HPT: Ahmedabad, Pij, Rajkot. LPT: Surat, Dwaraka*, Vadodara, Bhavnagar, Bharuch, Patna, Navasari.

Haryana - LPT: Hissar, Bhiwani.

Karnataka - HPT: Bangalore, Gulbarga. LPT: Dharwad, Mysore, Mangalore, Belgaum, Bellary, Devangare, Bhadravati, Bijapur, Raichur, Gadeg Betagari, Hospet.

Kerala - HPT: Trivandrum, Cochin. LPT: Calicut, Cannanore, Palghat.

Madhya Pradesh: HPT: Bhopal, Indore, Raipur. LPT: Jabalpur, Gwalior, Ratlam, Sagar, Burhanpur, Rewa, Murwara, Bilaspur. Under Implementation: Singrauli, Korba.

Maharashtra: HPT: Bombay, Nagpur, Pune. LPT: Sholapur, Nasik, Kolhapur, Aurangabad, Sangli, Amravati, Malagaon, Akola, Dhula, Nanded, Ahmednagar, Jalgaon, Jalna, Bhūsawal, Chandrapur, Latur, Parbhani, Gondiya.

Manipur: LPT: Imphal* Under Implementation: Ukhrul.

Orissa: HPT: Sambalpur. LPT: Rourkela, Bhubaneswar, Berhampur, Koraput. Under Implementation: Cuttack.

Rajasthan: HPT: Jaipur. LPT: Jodhpur, Ajmer, Kota, Bikaner, Udaipur, Alwar, Ganganagar, Bhilwara, Khetri, Jaisalmer, Barmer, Suratgarh.

Punjab: HPT: Amritsar, Jalandhar. LPT: Pathankot, Bhatinda*

Tamil Nadu: HPT: Kodaikanal, Madras. LPT: Tiruchirapalli, Salem, Vellore, Kumbakonam, Coimbatore. Under Implementation: Neyveli.

Uttar Pradesh: HPT: Allahabad, Agra, Gorakhpur, Lucknow, Mussoorie, Kanpur, Varanasi. LPT: Bareilly, Deoria, Moradabad, Aligarh, Jhansi, Sultanpur, Rai-Bareilly, Faizabad, Etawah, Behraich, Shahjahanpur, Rampur, Pauri, Farukhabad, Nainital, Pithoragarh.

West Bengal: HPT: Asansol, Calcutta, Murshidabad, Kurseong. LPT: Kharagpur, Malda, Bardhaman, Balurghat, Shantiniketan. Under Implementation: Siliguri.

Himachel Pradesh: HPT: Kasauli. LPT: Kulu, Shimla.

Jammu & Kashmir. HPT: Srinagar. LPT: Leh, Kargil, Jammu* Under Implementation: Poonch.

Meghalaya: LPT: Tura* Shillong* Pondicherry: LPT: Pondicherry.

Nagaland. LPT: Kohima* Under implementation: Dimapur.

Mizoram. LPT: Aizawl*

Sikkim. LPT: Gangtok.

Tripura. LPT: Agartala*

Andaman & Nicobar Island. LPT: Port Blair, Car Nicobar.

Arunachal Pradesh. LPT: Itanagar* Under implementation: Tezu, Pasighat.

Goa, Daman & Diu. HPT: Panaji.

All India Radio. With a network of 87 broadcasting centres supported by 128 medium wave transmitters, AIR serves 89 per cent of the population and about 78 per cent of the total area of the country. This includes far-flung areas like Leh, and Tawang and the distant islands like the Andaman, Nicobar and Lakshadweep.

The medium-wave service is supplemented by 35 shortwave transmitters and four FM transmitters. 38 stations of AIR have been provided with facilities to receive the signal from INSAT-1B and this has brought about an improvement in the quality of relay of centrally-originated programmes from Delhi.

The most important events of 1984-85 were the 23rd Olympics, the Indo-Soviet Joint Manned Space Flight, Demise of Smt. Indira Gandhi and the General Elections. These were widely covered by All India Radio both in its Home Service and in the External Services.

Reports in Hindi and English were broadcast on Olympic Games. In addition, running commentaries in Hindi and English were broadcast on the Olympic hockey matches

HPT: High Power Transmitter.

LPT: Lower Power Transmitter.

* LPTs being upgraded to HPTs.

between Indian and Malaysian, Spanish, Australian and West German teams, as also on the semi-finals and finals in the Olympic Games. Special news bulletins in Hindi and English were put out giving highlights of the day's events.

News Services. The News Wing of the All India Radio broadcasts every day 256 bulletins for a duration of over 35 hours in its Home, External and Regional services. In the Home Service from Delhi, 68 national bulletins were put out in 19 languages for a duration of 10 hours and 8 minutes daily.

In the regional service, 124 bulletins, including three from Delhi, were broadcast daily in about 60 languages and dialects for a duration of 16 hours and 11 minutes. In the external services, 64 bulletins in 24 languages were put out every day from Delhi, Calcutta, Bombay and Madras for a duration of about nine hours. A regular ten-minute bulletin in Hindi from 23:45 hours to 23:55 hours followed by a five-minute commentary was introduced in a Gulf Service of All India Radio from 28 May 1984. A five-minute bulletin in Punjabi was introduced from Chandigarh from 15 August 1984.

External Service. All India Radio's external service broadcasts daily programmes for 57 hours and 15 minutes in 25 languages for listeners in different parts of the world. The target areas to which the external broadcasts are addressed include West, North, East and South East Asia; North West and East Africa; Australia and New Zealand; Europe and the United Kingdom and the Indian subcontinent and extend in all to 54 countries.

Services in 16 foreign languages and a General Overseas Service (GOS) in English seek to strengthen ties of friendship and forge cultural links with the peoples of the countries to whom these broadcasts are directed.

The foreign language broadcasts comprise 28 transmissions for about 30 hours a day. All are daily services of varying duration. Arabic programmes account for two and a half hours, Chinese (both Kouyu and Cantonese) and Pushtu two hours each, Nepali one hour and 40 minutes, Persian one hour forty-five minutes, Swahili, Indonesian,

Russian, and French for one hour each. The General Overseas Service in English is for nine hours and thirty minutes and it is put out on the air in four transmissions directed to different parts of the world.

Overseas broadcasts in eight Indian languages are radiated in 17 transmissions a day for a total duration of about 27 hours and 15 minutes.

The services in Hindi, Tamil, Gujarati and Konkani are directed to Indians overseas while those in Urdu, Bengali, Punjabi and Sindhi are meant for listeners in the Indian subcontinent and countries on India's borders.

A new Gulf Service in Hindi for Indian workers and settlers in West Asia was started on 28 May 1984.

Educational. Seventy-one AIR stations put out educational programmes in 16 languages. The emphasis was on primary and informative education to support the universalisation of primary education and national educational projects.

All India Radio is now broadcasting about 50 per cent of the formal educational programmes to primary schools. These are enrichment programmes not closely related to the syllabus. However, broadcasts for secondary schools are closely related to the syllabus prescribed by the respective States.

There is also a weekly programme service for teachers. These programmes are planned in consultation with teachers and educational authorities. Broadcasts also include items related to freedom struggle and national integration. Radio support to correspondence courses of Delhi, Madurai, Punjab and Punjabi universities and the Open University, Hyderabad, is being provided from the stations in the respective zones.

Besides the daily programme of 'Jai Mala' in Vividh Bharati, some of the AIR stations provided separate programmes for the armed forces.

Sports events were covered by All India Radio both in the national hook-up and from the regional stations through running commentaries, resumes, radio reports, sports magazines, talks and interviews, etc.

Commercial Services. The Vividh Bharati service provided light entertainment

to the listeners. Sixty per cent of the time was devoted to film music and the rest was covered by devotional, light music and spoken word programmes in the form of short plays, interviews, etc. Two high power short-wave transmitters at Madras and Bombay carried the transmissions.

There are at present 29 commercial broadcasting centres. Ten per cent of the total broadcasting time from these centres is allotted to advertisements. Stations, were, however, permitted regional variations depending upon the language and the local need.

With a view to secure a larger reach of the advertisement message, a scheme was introduced for broadcasting commercials on the national network from April 1982. The net income from commercial broadcasting service for 1982-83 was Rs.13,33,01,239 and for 1983-84 Rs. 15,81,16,599.

AIR Stations on Jan. 1, '85

Andhra Pradesh: Hyderabad, Vijayawada, Visakhapatnam, Cuddapah.

Assam: Guwahati, Silchar, Dibrugarh.

Bihar: Patna, Ranchi, Bhagalpur, Darbhanga.

Gujarat: Ahmedabad, Vadodara, Bhuj, Rajkot.

Haryana: Rohtak.

Himachal Pradesh: Shimla.

Jammu & Kashmir: Srinagar, Jammu, Leh.

Karnataka: Bangalore, Bhadravati, Dharwad, Gulbarga, Mangalore/Udupi, Mysore.

Kerala: Alleppey, Calicut, Trichur, Trivandrum.

Madhya Pradesh: Ambikapur, Bhopal, Chhatarpur, Gwalior, Indore, Jabalpur, Jagdalpur, Raipur, Rewa.

Maharashtra: Aurangabad, Bombay, Jalgaon, Nagpur, Parbhani, Pune, Ratnagiri, Sangli.

Manipur: Imphal.

Meghalaya: Shillong, Tura.

Nagaland: Kohima.

Orissa: Cuttack, Jeypore, Sambalpur.

Punjab: Jalandhar.

Rajasthan: Jaipur, Ajmer, Bikaner, Udaipur, Jodhpur, Suratgarh.

Sikkim: Gangtok.

Tamil Nadu: Coimbatore, Madras, Tiruchirapalli, Tirunelveli, Nagercoil.

Tripura: Agarthala.

Uttar Pradesh: Lucknow, Allahabad, Varanasi, Rampur, Kanpur, Mathura, Gorakhpur, Najibabad.

West Bengal: Calcutta, Kurseong, Siliguri.

Adnanman & Nicobar Islands: Port Blair.

Aruchal Pradesh: Passighat, Tawang, Tezu.

Chandigarh: Chandigarh.

Delhi: Delhi.

Goa, Daman and Diu: Panaji.

Pondicherry: Pondicherry.

Mizoram: Aizawl.

Lakshadweep and Minicoy Islands: Nil.

Dadar and Nagar Haveli: Nil.

122. FILM : BURGEONING NUMBERS

India continues to produce the largest number of feature films in the world. In 1985, the number of feature films certified was 912 compared to 833 films in 1984. Even though there have been a handful of outstanding films, the large majority of them continued to be run of the mill escapist fares.

Here is a language wise break up of film produced in 1985. Figures of 1984 in brackets:

Production on the rise: Telugu: 198 (170), Tamil: 190 (148), Hindi: 187 (165), Malayalam: 137 (121), Oriya: 17 (14), Marathi: 16 (10),

Note: The statement does not include the two megawatt transmitters at Rajkot and Calcutta as also the shortwave transmitters at Aligarh and Delhi which are mainly utilised for the external/internal news link-up etc.

Hariyanvi: 10 (4), Assamese: 10 (5), Bhojpuri: 6 (1), Nepale: 4 (1), Rajasthani: 3 (2), Urdu: 2 (1).

Productions fell in the following languages. Kannada: 69 (81), Bengali: 28 (35), Gujrati: 22 (30), Punjabi: 8 (10).

Films Division: The Films Division, set up in 1948 with headquarters at Bombay, mobilises the medium of film to disseminate information on important aspects of the country's life.

Under the compulsory exhibition scheme, over 12,000 public cinema halls in India screen Films Division's documentary films or news Magazines at every show. It is estimated that about seven crore people see them in a week. Selected films are also shown in rural areas by the Directorate of Field Publicity. Some films are supplied to Indian missions abroad. The films are also utilised by the Doordarshan Kendras for telecasting. The Division releases over 38,000 prints of its documentary films and news magazines for theatrical exhibition and about 15,000 prints for non-commercial exhibition in India every year. The documentaries and newsreels produced by State Government film units are also released through the distribution network of the Films Division.

An important project for production of documentary films on India's Struggle for Freedom was launched by Films Division during 1984-85. Starting with the first film "The Beginning - 1857" released on August 15, 1984, one film in this series was released every fortnight. These were also telecast on Doordarshan.

The Films Division started producing fortnightly news magazines from February 1, 1984. During April-December, 1984, it produced and released 19 fortnightly news magazines. Besides, 8 of Films Division's newsreel officers covered news clips for Doordarshan regularly.

During April-December, 1984, the Division produced 55 documentary films.

Awards. During April-December, 1984, the Films Division participated in 12 international film festivals by entering 67 films.

The following major international awards were won:

Title of the Film	Award
1. Water Hyacinth-A Turned to Wealth	Silver Ear, 13th International Agricultural Film Competition, Berlin.
2. Kalank	Diploma of Merit, 26th, International Leipzig Documentary and Short Film Festival for Cinema and Television.
3. Plant Tissue Culture	Rikola Tesla Bronze Medal 13th International Film Festival of Scientific Films, Belgrade.
4. The Decision is Yours	Diploma of Honour, 7th International Competition for

5. Non-Conventional Energy Resources

Medical Films, Marburg, West Germany
Second Prize, International Film Festival Agrifilm 84 Slovak, Prague.

The following films received awards at the National Film Festival, 1984.

Title of the Film

1. **A Race with Death**
2. **INR 1789**

Awards

Best Animation Film
Best Newsreel Cameraman Award
(Special Mention (Certificate))

3. Against the Current

4. **Two Men and an Ideal**
5. **-do-**
6. **Rejuvenation**
7. **Bidaai**

-do-
-do-
-do-
-do-

The Award for the film 'A Race With Death' was Rajat Kamal and a cash prize of Rs. 2,500 to the producer.

Film Certification. Films can be publicly exhibited in India only after they have been certified by the CBFC. The Board, set up under the Cinematograph Act, 1952, consists of non-official members and a chairman. It has five regional offices at Bombay, Calcutta, Madras, Bangalore and Trivandrum. One more office is to be set up at Hyderabad shortly. The regional offices are assisted in the examination of films by advisory panels which include eminent educationists, art critics, journalists, cine-artistes, social workers, doctors and others.

The Bangalore and the Trivandrum regional offices were inaugurated on April 12, 1984 and April 22, 1984 respectively. In March 1984 a Film Certification Appellate Tribunal was constituted, with headquarters at New Delhi, to hear appeals against the decisions of the Board of Film Certification.

The requirement of re-certification of films after every 10 years was dispensed with in September 1984. The Cinematograph (Certification) Rules 1983 were amended on February 28, 1984 to provide for separate certification of video films by the CBFC for their public exhibition. The Cinematograph Act, 1952 was also amended to enhance the penalties for contravention of the Act and also to prescribe minimum punishment for exhibition of uncensored video films.

The production graph of feature films in the country shows continuous rise during the last 34 years since the inception of the CBFC (Central Board of Film Censors) in 1951. That year saw a total of 219 films. The number rose

Indian Feature Films Certified During 1984

Language	Bombay	Calcutta	Madras	Bangalore	Trivandrum	Total
1. Telugu	-	-	170	-	-	170
2. Hindi	129	2	34	-	-	165
3. Tamil	-	-	148	-	-	148
4. Malayalam	-	-	105	-	16	121
5. Kannada	-	-	57	24	-	81
6. Bengali	1	34	-	-	-	35
7. Gujarati	30	-	-	-	-	30
8. Marathi	25	-	-	-	-	25
9. Oriya	-	14	-	-	-	14
10. Punjabi	10	-	-	-	-	10
11. Bhojpuri	8	1	-	-	-	9
12. Assamese	-	5	-	-	-	5
13. Nepali	2	2	-	-	-	4
14. Haryanvi	4	-	-	-	-	4
15. Rajasthani	2	-	-	-	-	2
16. Manipuri	-	2	-	-	-	2
17. English	2	-	-	-	-	2
18. Urdu	1	-	-	-	-	1
19. Brijbhasha	1	-	-	-	-	1
20. Khasi	-	1	-	-	-	1
21. Garhwali	1	-	-	-	-	1
22. Sindhi	1	-	-	-	-	1
23. Tulu	-	-	1	-	-	1
Total	217	61	515	24	16	833

to 273 in 1954, 304 in 1964, 435 in 1974 and 833 in 1984.

The language-wise production pattern of feature films which was observed last year maintained its status quo during this year as well. Telugu dominated the 1984 scene with 170 films followed by Hindi (165). The third place was taken by Tamil (148) and the fourth by Malayalam (121).

All Colour. Colour predominates in the production of feature films in India. In 1985, out of a total of 912 films, 892 films were in colour (98 per cent). Social themes continued to dominate the Indian film scene in 1985 followed by crime themes.

The proportion of Indian feature films certified for public exhibition restricted to adults only is going up. In 1976 out of a total of 507 films certified, 27 were given 'A' certifi-

cates (5.32 per cent). As against this in 1984 out of 833 films, 301 were given 'A' certificates (36.13 per cent).

The Board granted 710 'U' certificates, 4 'UA' certificates, 14 'A' certificates and 25 'S' certificates in respect of foreign short films and 23 'U' certificates, 7 'UA' certificates and 27 'A' certificates in respect of foreign feature films in 1984. The Board also granted 1562 'U' certificates, 1 'UA' certificate, 67 'UA' certificates and 301 'A' certificates in respect of Indian feature films in 1984. Indian video feature films certified during the year numbered 41.

A total length of 22,961.84 metres was excised from films before their certification in 1984. The Board classified 648 films as predominantly educational in 1984.

Video Piracy. A number of steps were taken to combat video piracy. Important

measures that the Government took in this regard were:

(i) Cinematograph Act 1952 was amended with a view to discouraging exhibition of uncertified video films. The Cinematograph (Amendment) Act, 1984 which came into force on August, 27, 1984 provides for enhanced punishment for exhibiting uncertified films (including a video film). A minimum punishment has also been prescribed for offences relating to exhibition of uncertified video films.

(ii) The matter regarding amendment of the Copyright Act, 1957 was taken up with the Ministry of Education with a view of curbing video piracy. The Copyright (Amendment) Act, 1984 which came into force on October 8, 1984 also provides for enhanced punishment for different kinds of offences under the Act so as to make them deterrent. The amendment for the first time prescribes a minimum punishment.

(iii) The Cinematograph (Certification) Rules, 1983 were amended to provide that all video films will have to be got certified separately by the CBFC, even though the films might earlier have been certified by the Board. The rules were further amended to provide that an applicant for certification of video films will have to produce a certificate from the producer of the film or its copyright holder.

Film Festivals. The Directorate of Film Festivals, which is a part of the National Film Development Corporation, a public sector undertaking under the Ministry of I & B is entrusted with the following functions:

(a) Organisation of international film festivals in India. (b) Participation in international films festivals abroad. (c) Organisation of national film festival. (d) Organisation of films weeks under cultural exchange programme in India and abroad. Activities under (c) and (d) are being carried out by the Directorate on behalf of the Government of India.

The Directorate organised the 10th International Film Festival of India in Delhi from January 3-17, 1985, with active collaboration of the Indian film industry. In all, 23 feature films and 7 short films competed for different awards which were decided by a nine-member international jury headed by Ms. Jeanne Moreau (France). The Golden

Peacock Award for the best film was shared by "Ruthless Romance" (USSR) and "The Bostonians" (UK)

In addition to the information and Indian panorama sections, the festival had retrospectives of eminent foreign directors, Luchino Visconti (Italy), Alexander Korda (UK) Nikita Nikhalkov (USSR) and Shohei Imamura (Japan). The Indian retrospectives section contained films of prominent films personalities like K.A. Abbas, Puttana Kanagal, Tapan Sinha and Sivaji Ganesan.

The Directorate organised the 31st National Film Festival in June, 1984. Earlier, the jury for the feature films under the chairmanship of Mr. K. Balachander, jury for films other than feature under the chairmanship of Mr. S. Krishnaswamy and jury for the best book on cinema under the chairmanship of Justice G.D. Khosla decided various awards.

Children's Films. The Children's Film Society, India (Bal Chitra Samiti, Bharat) was set up in May 1955 as an autonomous body with the avowed objective of producing/acquiring, distributing and exhibiting films designed for children and neo-youth. Besides its head office and marketing distribution division at Bombay, the society has its zonal offices at New Delhi, Madras and Calcutta.

During the year 1984-85, the society completed production of a Rajasthani Children's film "Jangler Madhya Gambhuj" (35mm feature in colour). Three more feature films "Durga" (Oriya film in 35mm-colour); "Dhomaketu" (Hindi film in 35mm-colour); and "Kukudoo Koo" (Hindi feature film in 35mm-colour) are also expected to be completed by March 1985. In addition, production of two short animation films viz. "Aasman Gir Raha Hai" and "Piety Prospers" are also expected to be completed by March, 1985.

The Society has completed dubbing of six versions of feature films during the year. In addition to its normal activity of organising film shows for children throughout the country, the Society organised a Children's film festival in Mauritius in November 1984 in collaboration with the Government of Mauritius on the occasion of the 150th year of Indian immigration to Mauritius.

NFDC. The National Film Development Corporation (NFDC) was set up in 1975

as a Central agency to promote good cinema in the country. The primary aim of the Corporation is to plan for, promote and organise the integrated development of the film industry in India. In keeping with these activities, NFDC provides a wide range of services essential to the encouragement and development of good Indian Cinema.

The Corporation gives loans to deserving cases for production of good quality films and for purchase of film production equipment. As on December 31, 1984 the Corporation had sanctioned loans for 145 films and 57 documentaries. Out of these, 114 films were completed. During 1983-84, out of 34 applications received, 3 were sanctioned and an amount of Rs. 16.26 lakhs was released; 5 films and 2 documentaries were completed during the year. Out of 11 film projects approved for cent per cent financing, the films "*Atyachar*", "*Adi Sankaracharya*", "*Ghare Baire*", "*Godan*", "*Jaane Bhi Do Yaaro*", "*Music of Satyajit Ray*", "*Party*" and "*Tarang*" were completed.

Under the scheme for construction of low cost cinema theatres, the Corporation has so far sanctioned loans amounting to Rs. 554.07 lakh to 88 applicants. Out of these, 36 theatres were completed and started screening films.

Co-production. The Corporation inaugurated its programme of co-production with "*Gandhi*" directed by Sir Richard Attenborough. The Corporation invested Rs. 636.31 lakh on the project and received an amount of Rs. 1069.91 lakh as its share from the earnings of the film till the end of 1984.

In collaboration with Doordarshan and Films Division, NFDC also plans to make films specially for television, both in India and abroad. Prominent directors will be commissioned to make these films. During the period, upto December 1984, the Corporation imported 15 films. With this the total number of films imported by the Corporation stands at 283 from 23 countries; 173 films were in circulation during the year. Apart from acquiring playing time, the Corporation is showing its film at the Akashvani theatre in Bombay.

Till the end of December, 1984, the Corporation cleared shipping bills for export of feature films worth Rs. 5.09 crore and video rights shipping bills amounting to Rs. 118.43

lakh under canalisation. The NFDC's own exports during the period were worth Rs. 80.35 lakh.

National Archive. NFAI (National Film Archive of India) with headquarters at Pune is a pioneer institution set up in 1964 with the objectives of acquisition and preservation on National Cinema, film classification, documentation and research encouraging film technology and spread of film culture in the country.

The most important acquisition of the year has been a set of film records of famous Hindustani classical singers, singing before the camera. These rare on-real shorts were made by veteran film maker J.B.H. Wadia between 1937 and 1947 in the "Variety Entertainment short series" programmes of his Wadia Movieton.

The classical singers filmed in the series include: Ahmed Dilawar, Fida Husain Jalandhary, Firoze Dastur, Kumar Gandharva, Malika Pukhraj, Miss Sarita Devi, Sardar Mansoor and Zohrabai Ambala-Wali.

A new regional office of the Archive has started functioning at Trivandrum, Calcutta and Bangalore regional offices set up earlier provided useful service to film societies, film study groups and film lovers in the respective region.

Film and TV Institute. The Film Institute of India was established in 1960 with the object of imparting technical training in a systematic manner in the art and craft of film-making. With the extension of its sphere of activities to provide in-service training in Television to officers and staff of Doordarshan, the Institute was renamed as the Film and Television Institute of India. On October 1, 1974, the Institute became a Society registered under the Registration of Societies Act of 1860.

The Film Wing offers courses leading to Diploma in cinema with specialisation in areas (i) direction, (ii) cinematography, (iii) editing, and (iv) sound recording and sound engineering (SRSE). Thirty-nine students were admitted during the year for the first year integrated course leading to one of the specialisations. The Second batch of Post-Diploma course in Film Direction was started from July, 1984. The total number of

students on the rolls during the academic year is 139 including 22 from abroad.

The Institute and the National Film Archive of India jointly conducted the 10th Film Appreciation Course from 18th June to 21 July 1984. Seventy participants comprising teachers, journalists, writers, media officers, etc. attended the course.

Both these bodies have been re-constituted by appointing new members in April 1984. Shri Mrinal Sen is the President/Chairman of the FTII Society/Governing Council.

Advent of Cinema. The cinema came to India as early as 1896. The first motion picture was shown in India on July 7, 1896 at Watson's Hotel, Bombay by the touring agents of the famous Lumiere Brothers of France. The show had a duration of less than an hour and consisted of items like 'the arrival of a train, the sea bath, workers leaving a factory and ladies and soldiers on wheels'. *The Jubilee Procession* in England in 1897 was the next important exhibition in India. It became a hit. Indian scenes captured by some foreign photographers were also shown now and then, with items like *Coconut Fair*, *Our Indian Empire* and a *Panorama of Indian Scenes*.

The first Indian to make a film was Harischandra Bhatvadekar, also known as Sava Dada. In 1899 he photographed and exhibited his own short items, *The Wrestlers* and *Man and Monkey*. By this time a change had come in film exhibitions in Europe instead of photographing actual scenes, imaginary scenes were staged by actors which were photographed into films. *The Death of Nelson* was one such. This opened a new line in film photography which was destined to revolutionise the film industry.

Feature Films. The first Indian story film *Pundalik* was made by R.G. Torney and N.C. Chitra and released at the Corporation Cinematograph, Bombay, on May 18, 1912. This film centred round a saint of the same name in Maharashtra. The next year, on May 3, 1913, Dada Phalke released the long film story *Raja Harischandra* at the same theatre. *Pundalik* was half-British in its make, it being photographed by an English cameraman Johnson. *Raja Harischandra* was cent per cent Indian. Dada Saheb did everything

himself from the script down to the marketing of the film. For this reason, Dada Saheb Phalke has been rightly acclaimed as the *Father of the Indian Cinema*. Phalke laid down the basic norms of Indian films, in form and content, which have been largely followed ever since.

Phalke went on to produce two more films *Mohini Bhasmasur* and *Satyavan Savitry* both drawn from Hindu mythology. He took his 3 films to London, where they were exhibited. They won all round praise.

In September 1917, Phalke released his most ambitious film venture, *Lanka Dahanam*, again a mythological story. Exhibited in a double programme, with an English film called *The Blind Fate*, *Lanka Dahanam* (Burning of Lanka) proved to be a big box-office hit. This success conclusively dispelled all fears about the future of the film industry in India.

In March 1917, J.F. Madan of Calcutta produced *Satyavadi Raja Harischandra*, based on the same mythological story as Phalke's *Raja Harischandra*.

These three men, R.G. Torney, Dada Saheb Phalke of Bombay and J.F. Madan of Calcutta are the pioneers of the film industry in India. J.F. Madan was, in addition, the pioneer of cinema houses. In 1907, he built India's first cinema house in Calcutta. His company, the *Elphinstone Bioscope Company*, sponsored the gigantic chain of cinema houses in India, later known as Madan Theatres.

Madras entered the film industry with *Keechaka Vadhom*, a mythological story, in 1919. With the end of the First World War many sub-centres of Film production emerged—*Kolhapur*, *Nasik*, *Sangli* and *Poona*, around *Bombay*, *Vijayawada*, *Salem* and *Coimbatore*, around *Madras* and *Gauhati* and *Bhubaneswar* around *Calcutta*. By 1929, India was producing about 38 films a year. The production shot up to 270 in 1931, placing India among the three largest producers of feature films in the world.

Talkies. The talkies came to India with a bang and quickly displaced the movies. The first talkie in India *Alam Ara*, was made by Ardeshir Irani in 1931 at the Imperial Film Studio in Bombay. It was in Hindustani and was screened at Bombay on March 1, 1931.

Iran as the pioneer of talkie is to be counted along with R G Torney, Dada Saheb Phalke and J F Madan as one of the founders of the Indian cinema.

Alam Ara was quickly followed by other Indian talkies which totalled 28 in 1931. The talkies tolled the knell of the silent films or movies. From a record production of 270 in 1931, the silent films came down to a mere 7 in 1934 and faded out completely by 1936. In 1971 India gained for the first time the top place in world film production and has maintained the lead ever since.

Between May 18, 1912 when the first Indian feature film, *Pundalik* was exhibited and May 18, 1972 when the country celebrated the Golden Jubilee of the film industry, India had produced a total of 11385 films (including 1279 silent films) in 27 languages, five of them foreign—English, Arabic, Persian, Sinhala and Nepalese.

India continued to be the world's topmost producer of films when the talkie celebrated its Golden Jubilee in March 1981. In 1980, India had produced 742 films.

Newsreels. Weekly Indian News Review, cartoon films, quickies and documentaries required for public informa-

tion or education are produced by the Films Division in the Ministry of Information and Broadcasting. The Division first set up in 1948 started from small beginnings with about 33 documentary films, 12 compilations and 52 newsreels in 1949-50. Currently, the Division produces on an average 100 short films (including cartoon films) and 52 national newsreels.

The screen is today India's most popular entertainment. The fast growth of cinema houses in the country attests to this. There were 7522 permanent and 4754 temporary touring cinema houses in the country as in April, 1984.

Languages. Films are produced in all important languages of India and even in some provincial dialects like Bhojpuri, Konkani and Badaga. Till 1979, Hindi with its variants accounted for the largest number of films. After 1979, Hindi lost ground to South Indian languages.

As a single language, Telugu dominates the 1982 scene with 154 films followed by Hindi 148. However, if Urdu films are also added, the number of Hindi/Urdu films during the year comes to 155. Tamil has taken the third place (141) and Malayalam the fourth (117).

123. GROWING PRINT MEDIA

India has a large number of newspapers, but in a country of 750 million people, their circulation never comes anywhere near the ones in developed countries. India has a total number of 21000 newspapers and periodicals, but their aggregate circulation is just around 50 million. However, the print media is growing qualitatively in spite of the onslaught of the electronic media.

The office of the Registrar of Newspapers in India was set up in July, 1956. As functions are two-fold, namely, statutory and non-statutory. The statutory functions include:

(1) maintenance of a register containing particulars of all newspapers published in India; (2) keeping District Magistrates informed of the availability of titles for newspapers; (3) issuance of Registration Certificates in respect of newspapers; (4) watching the regularity of newspapers; (5) scrutiny of annual statements sent by publishers of newspapers; (6) verification and checking of

circulation claims of newspapers and (7) preparation of a report annually, containing information and statistics about the Press in India which is presented to Parliament every year.

The non-statutory functions are: (1) to work out and authorise newsprint entitlement to individual newspapers, according to the Newsprint Allocation Policy through the State Trading Corporation of India and also to advise the State Trading Corporation of India/Newsprint Advisory Committee regarding the quantum of Newsprint Import

needed; (2) to examine and certify the essentiality of printing, composing and allied machinery required by newspapers/periodicals and communicate it to the Chief Controller of Imports and Exports for possible import.

4000 New Titles. During the first nine months of 1984-85, 3,892 titles were cleared. It is expected that by the end of the year another 708 titles will have been cleared, bringing the total to above 4,600.

New newspapers numbering 850 were taken on record during the first nine months of 1984-85. The year is, however, expected to close with 1,252 registrations.

The circulation of 600 papers was checked during the first nine months of 1984-85. Another 150 papers are expected to be taken up for check during the next three months, bringing the total to 750 papers.

At the end of 1983, the Press Registrar had 20,758 general news-interest newspapers and miscellaneous journals on his record. Of these, 8,368 newspapers furnished their annual statements.

First Newspaper. The first newspaper in India on modern lines appeared in Calcutta on the 27th January, 1780. This was the *Bengal Gazette*, published in English by an Englishman, J.A. Hickey. Hickey's *Gazette* as it was popularly called, was a political and commercial weekly "open to all parties but influenced by none". However, it displeased the officers of the day and had to down shutters within an year. Messink and Reed who started the *India Gazette* also in 1780 played it safe, towing the official line. The *Calcutta Gazette* appeared in 1874. Other journals followed—the *Calcutta Chronicle*, The *Madras Courier* (1875), the *Bombay Herald* (1879) and others. Though all these papers took care not to offend the government, none of them could survive long. All these periodicals were run by Englishmen in English for the Englishmen in India.

During the Second World War, when the British administrators wanted the cooperation of the Indian people, a gentleman's agreement was concluded between the Government and the Press, which resulted in the Press Advisory Committee at the Centre and in most of the States. This gave the press a consultative status.

When India became free, there was no longer any antagonism between the Government and the people and the Press was free to play an entirely new role. In March 1947, the Government appointed a Press Laws Enquiry Committee, as a result of which, the obnoxious provisions of the Press Acts until then in force were removed and a policy of consultative co-operation between the Government and press was inaugurated.

After the proclamation of Emergency on June 25, 1975 three ordinances were issued (i) abolishing the Press Council (ii) repealing the Parliamentary (Protection of Publication) Act and (iii) promulgating a new law—The Prevention of Publication (Objectionable Matter) Act (POMA). The press was thus reduced to the position of an orderly of the government.

The Janata government which rode to power on the 1977 March elections promptly repealed the POMA, restored the Parliamentary Proceedings (Protection of Publication) Act and took steps to re-constitute the Press Council.

Language Press. Newspapers published in Indian languages was slow on the uptake. Nevertheless, a number of periodicals—most of them short-lived—appeared in India in the latter half of the 19th century. The oldest Indian language newspaper is *Bombay Samachar* in the Gujarati language which was established in Bombay in 1822.

Most of the Indian language journals owed their origin to the national consciousness awakened by the revolution of 1857 against British rule in India. Naturally, their tone and temper displeased the British administration. The result was the Vernacular Press Act 1878 which strictly controlled Indian papers. With the growth of the national movement, drastic press legislations followed one another—Official Secrets Act 1923, India Press (Emergency Powers) Act 1931, Foreign Regulation Act 1932, Indian States (Protection) Act 1934, etc.

The language papers greatly exceeded the English papers in number. In 1953 out of a total of 8134 newspapers, Indian language papers numbered 6800.

The English Press. The English Press also showed a healthy growth. In 1952 there were 70 English dailies. In 1977 there were 2559 English newspapers in India of which 85

were dailies. Six of these were centenarians. *The Times of India*, Bombay (1839), *The Pioneer*, Lucknow (1865), *The Amrita Bazar Patrika*, Calcutta (1868), *The Statesman*, Calcutta (1875) and *The Hindu*, Madras (1876).

Periodical journalism had from the first formed the major segment in Indian journalism. In 1952 there were 6166 weeklies and other periodicals among a total 6762 newspapers. In 1980 the periodicals increased to 16874.

In 85 Languages. Apart from the principal languages, newspapers were published in 69 other languages, and a few foreign languages. The highest number of newspapers were published in Hindi (5,655) followed by English (3,689).

The following table shows publication of newspapers language-wise at the end of 1982.

Language	Dailies	Weeklies
Hindi	442	2,594
English	11	417
Assamese	3	26
Bengali	43	403
Gujarati	39	173
Kannada	80	150
Kashmiri	—	1
Malayalam	103	120
Marathi	124	365
Oriya	11	33
Punjabi	24	174
Sanskrit	2	4
Sindhi	4	20
Tamil	102	124
Telugu	31	154
Urdu	134	654
Bilingual	32	358
Multilingual	9	66
Others	40	62
Total	1,334	5,898

Newsprint. The requirements of newspapers and periodicals in the country are met through three indigenous mills and by imports. Two new newsprint mills, viz., the Kerala Newsprint Mills and Mysore Paper Mills, commenced production in 1982. The production of the three domestic newsprint

'Manorama' Tops

According to ABC (Audit Bureau of Circulation) report for January-June 1985, the largest selling daily in India is *Malayala Manorama*, published from 3 centres. *Malayala Manorama* commanded a circulation of 6,33,538 copies.

Second comes *Indian Express* published from 11 centres with a circulation of 6,20,079 copies.

Malayala Manorama and *Indian Express* are the only dailies in India enjoying circulation over 6 lakh.

'*Times of India*' published from 3 centres comes 3rd with a circulation of 5,33,872 copies.

There are 4 newspapers having a circulation between 4 and 5 lakh, 3 between 3 and 4 lakh, 4 between 2 and 3 lakh and 8 between 1 and 2 lakh.

'*Anand Bazar Patrika*', Bengali daily, continues to be the largest circulated Single Edition Daily with a circulation of 4,21,833 copies followed by '*Jugantar*', another Bengali Daily, with 3,34,495 copies.

Language-wise English Papers led the Indian language dailies—23 English dailies having a circulation of 28,17,522 copies. This is followed by Hindi dailies—33 in number with 27,65,503 copies. Malayalam took the 3rd place with 13,65,826 copies.

Other Toppers: Weekly: '*Mangalam*', published from Kottayam—12,86,442 copies.

Fortnightly: *India Today*, published from Delhi—3,14,797 copies.

Monthly: *Manohar Kahaniyan*, published from Allahabad—3,65,593 copies.

mills in 1982-83 was 1,02,609 tonnes.

The Press Information Bureau (PIB) is the main channel of communication between the Government and the media; the information put out by the Bureau goes to dailies as well as news periodicals, news agencies and radio and television organisations, both Indian and foreign. With its countrywide tele-

printer network and airbag facilities, information put out by PIB goes to newspapers not only in Delhi but also in other parts of the country. While less than a thousand newspapers subscribed to the wire agencies, PIB distributed its press material to 6,897 newspapers in 1983-84.

The Second Press Commission, set up in 1978, under the Commission of Inquiry Act, 1952, to enquire into the growth and status of the Indian Press, submitted its report to the Government on 3 April 1982. The commission was headed by Justice K.K. Mathew. The Report contains 278 recommendations covering diverse aspects of the Press. Suggestions in respect of various recommendations are under the consideration of a Committee of Ministers.

Press Council. Under the Press Council Act, 1978, the second Press Council of India was constituted in February 1982 and Justice A.N. Grover was renominated as Chairman. He was the Chairman of the first Press Council, constituted in 1979, for a term of 3 years. The present Chairman is Justice A.N. Sen.

The Press Council safeguards freedom of Press, maintains and improves the standard of newspapers and news agencies. It is comprised mainly of representatives from the newspapers who are charged with the responsibility of regulating the conduct of their brethren in the same sphere. Thus, the Council has come to assume the role of a self-regulating body of the newspapermen themselves.

The Council has the power to consider complaints *suo-moto* in addition to inquiry into complaints brought before it. It has also been empowered to make observations against any authority including Government if it considers it necessary for the performance of its functions.

News Agencies. India has four news agencies—Press Trust of India (PTI), United News of India (UNI), Samachar Bharati and Hindustan Samachar. The four news agencies were merged in 1976 to form *Samachar*. *Samachar* was dismantled two years later and the four new agencies resumed their independent operations from 14 April 1978.

Press Trust of India Ltd. (PTI). Dr. D.N. Rd, Bombay-1; Estd. 1949. Largest Asian News

agency. It took over the business of the Associated Press of India. Subscribes to and exchanges news with major world news agencies and agencies in the developing countries. News H.Q. PTI Bld, 4, Parliament St., New Delhi.

Chairman: Ramnath Goenka. **General Manager:** P. Unnikrishnan.

United News of India (UNI), 9, Rafi Marg, New Delhi-1; Estd. March 1961, provides national and international news service. UNIVARTA (wire service in Hindi), Financial News Service, Banking News Service. It issues weekly backgrounder service (Eng & Hindi), Weekly Agriculture Service (Eng & Guj) Daily feature service, Economic Service (four times a week) and Energy News Service (Twice a week). Weekly News Service to UAE, Qatar, Bahrain and Kuwait through exclusive satellite channel.

Ch. Ed & GM: G.G. Mirchandani
Samachar Bharati, 13, Ferozshah Rd, New Delhi-1, Estd Oct. 2, 1966. Feeding nearly 200 newspapers in twelve Indian languages. Countrywide network of Devanagari teleprinters. Full fledged sports and commercial wings.

General Manager: Ghanshyam Pankaj.
Hindustan Samachar, 2, Connaught Lane, New Delhi-1; Estd Feb. 1948. Service in Hindi, Marathi, Nepali and Gujarati on Nagn teleprinters and summary service in other Indian languages.

General Manager: U.S. Gandhi.

Professional Associations.

There are about 25 Professional and Trade Associations in the print media. Among them are:

Indian and Eastern Newspaper Society (IENS), IENS Bldgs, Rafi Marg, New Delhi-1. Founded in 1938. It is a body of Newspapers and periodicals. Aims to promote and safeguard members' business interests incidental to producing their publications. Accreditation to advertising agencies given which fulfil certain conditions. Publishes annual Handbook. Total membership: 462, Accredited advertising agencies: 301.

President: Basudev Ray, **Secretary:** S.C. Rao.

Audit Bureau of Circulations Ltd. (ABC), Wakefield House, Ballard Estate, Bombay. The ABC was incorporated in 1948 as a nonprofit making company with no share

capital and liability limited by guarantee. Its affairs are controlled by a Council of Management, half of which retires by rotation and is elected at the Annual General Meeting each year. Equal representation is given on the Council to nominees of publishers on one hand and advertisers and advertising agencies on the other. The Chairman is elected alternatively from each group. The Bureau's object is to certify the Net Paid Circulation of Newspapers and Periodicals.

Chairman: J.C. Chopra, **Exec. Secy:** C.S. Karnik.

Indian Languages Newspapers' Association (ILNA), Janmabhoomi Bhavan, Ghoga St., Fort, Bombay-1. Founded 1941. Any newspaper or periodical published in any of the Indian languages or an organisation or society of newspapers is eligible for membership. Publishes "Language Press Bulletin" in English.

President: K.L. Deshpande; **Hon. Gen. Secys:** L.M.D. Costa, Kirah R. Sheth, Nana Dingle.

All India Newspaper Editors' Conference (AINEC) 36-37, Northend Complex, Ramakrishna Ashram Marg, New Delhi-1. Organisation of newspapers and periodicals as represented by their editors, concerned chiefly with interest of editorial section of the newspaper industry, founded 1940.

Membership: Any newspaper or periodical published in India qualifies. Present membership: 325.

President: Vishwa Bandhu Gupta, **Sec. Gen:** M.S. Madhusoodanan.

Editors Guild of India, Delhi Press Bldg., Jhandewala Estate, Rani Jhansi Marg, New Delhi-110 055. Organisation formed in 1978 to "uphold freedom of the press, strive for improvement of professional standards, safeguard editorial independence", etc. Present membership: 65.

President: B.G. Verghese, **General Secretary:** Viswanath.

Indian Federation of Working Journalists (IFWJ), Flat No. 29, Shankar Market, Connaught Circus, New Delhi-1. A Federal all-India body representing journalists' trade union. Recognised by Government as the representative organisation of the working journalists, on Wage Board.

President: Vikram Rao, **Secy. Gen:** K.M. Roy.

National Union of Journalists (India) 7, Jantar Mantar Rd, New Delhi-1. Founded in 1972. A federation of Working Journalists' Unions with affiliated units in all States.

President: Prithvis Chakravarti, **Secy. Gen.:** N.K. Trikha.

Press Institute of India, Sapru House Annexe, Barakhamba Rd., New Delhi-1. Professional body of Indian Newspapers and Journals, set up in 1963. Holds professional workshops and seminars for editorial and managerial personnel at all levels; places consultants from home and abroad to work with Indian newspapers, and organises selection of Indian journalists for various foreign scholarships. Publishes books relating to mass media, a bi-monthly journal *Vidura*, and *Data India*, a weekly. Edits and produces a feature news service, Depthnews India. Newspapers, periodicals and house journals qualify for membership which is corporate.

Chairman: G. Kasturi, **Director:** K. Bhupal. **Research Institute for Newspaper Development**, 38, Pantheon Rd, Madras-8. Conducts research and training in newspaper production and management, provides information and consultation to newspaper management. Publishes monthly bulletin: *RIND Survey*.

Chairman: K.M. Mathew, **Director:** C.G.K. Reddy.

124. NEW PATH FOR EDUCATION

Modern Education in India has been the legacy of the British Raj. Now the government has decided to restructure the whole pattern to make it "an effective instrument for taking the country into the 21st century." A series of discussions were organised all over the country to identify the right objectives of the new direction.

Education Minister, Mr. K. C. Pant announced in the Lok Sabha on April 8, 1985

that government had targeted to implement the new education policy from the academic

year 1986-87. Government prepared a status document, 'Challenge of Education - A Policy Perspective' which was placed in the Parliament and sent to all concerned around the country. The next step was a "rigorous diagnostic exercise" to find out the weaknesses of the existing system.

Delinking from Job. The idea was to make education cognisant of the needs of new world at the turn of the century, inculcating at the same time in the young positive values and a sense of pride in their country, its culture and its heritage. These are all ingredients of national self-confidence. At the same time government has announced a proposal to delink education from jobs.

Government wants to achieve universal elementary education by 1990. During the Seventh Plan, some 64 million additional children would have to be brought into schools, with at least 28 million of them passing through the formal system and the remaining 36 million taking into the non-formal system.

The current school drop-out rate was an alarming 76.6 per cent. If this was to be brought down, there had to be the right social climate for it. Adult education has to be made a fully people's movement. With 64 per cent of the country's population still illiterate, it has also to take the form of a massive movement of functional literacy.

State subject. Education is practically a State subject, although it is included in the Concurrent List. The Central Government has little to do with it, particularly at the

crucial primary level. In secondary education, the Central government comes into the picture. However, in higher education and research it is the Central government that dominates the scene.

With the Central and State governments sharing powers and the States themselves differing in their administrative tactics, it is no wonder that the educational picture of India shows wide regional disparities. It is in this context, that a National Policy on Education was formulated.

The National Policy on Education adopted by the Parliament in 1968 was mainly based on the recommendations of the Education Commission under Dr. D. C. Kothari. The policy stressed the following objectives.

(i) Free and compulsory education upto the age of 14; (ii) improved status, emoluments and education of teachers; (iii) three-language formula and development of regional languages; (iv) equalisation of education of science and research; (v) development of education for agriculture and industry; (vi) improvement in quality and production of inexpensive text-books; and (vii) investment of 6 per cent of national income in education.

School Education. Keeping in view the goal enshrined in the Constitution, the programme of Universalisation of Elementary Education has been accorded a very high priority to ensure essential minimum education to all children upto the age of 14 years. An outlay of Rs. 905 crore was earmarked for Elementary Education out of the total outlay

School Enrolment

(Figures in lakh)

	1979-80	1980-81	1981-82	1982-83	1983-84	1984-85 (approx.)
Age-Group 6-11						
Classes I-V	710.02	727.16	753.25	775.93	805.97	836.77
Percentage of age-group	83.72	85.33	87.76	89.87	93.3	95.73
Age-Group 11-14						
Classes VI-VIII	194.01	204.31	218.13	235.81	254.78	272.37
Percentage of age-group	40.16	41.72	43.96	46.90	50.7	53.23
Age-Group 6-14						
Classes I-VIII	904.03	931.47	971.38	1011.74	1060.75	1109.14
Percentage of age-group	67.91	69.36	71.71	74.05	78.01	80.04

of Rs. 2,524 crore for Education as a whole under the Sixth Plan (or 36% of the total). According to the available reports, the total enrolment in classes I-VIII by the end of 1984-85 is likely to reach upto 1109.14 lakh. Over and above this, about 35 lakh are expected to be covered through Non-Formal Education.

Education in all schools upto class 8, is now free in all States and Union Territories except for boys in classes 7-8 in Uttar Pradesh.

Legislation for compulsory education, as per constitutional directive, exists in 16 States and 3 Union Territories, namely, Andhra Pradesh, Assam, Gujarat, Haryana, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal, Andaman and Nicobar Islands, Chandigarh and Delhi. In Himachal Pradesh, the Act covers the entire elementary stage (classes I-VIII) while in the remaining States/Union Territories it covers only the primary stage (classes I-V).

Enrolment. In the base year of the Sixth Plan, i.e. 1979-80, the enrolment at the primary stage stood at 710.2 lakh or 83.72% of 6-11 age-group population and 194.01 lakh at the middle stage or 40.16% of 11-14 age group population. The targets of additional enrolment during the Sixth Plan was 180 lakh of 6-14 age group population - 117 lakh at primary stage and 63 lakh at the middle stage. The likely additional enrolment by 1984-85 would be 205.11 lakh against the target of 120 lakh through formal system.

All the States and 5 Union Territories have non-formal education programmes for out-of-school children including non-starters and drop-outs. Non-formal education is being developed as a massive alternate supportive system of formal schooling. The main thrust and maximum extent of coverage is in the 9 educationally backward States, viz., Andhra Pradesh, Assam, Bihar, Jammu & Kashmir, Madhya Pradesh, Orissa, Rajasthan, Uttar Pradesh and West Bengal, who were receiving Special Central assistance under a Centrally sponsored scheme of non-formal education for elementary age-group children.

Help of INSAT. In the context of INSAT utilisation, State Institutes of Educa-

tional Technology (SIET) are being set up in the six INSAT States, namely, Andhra Pradesh, Bihar, Orissa, Gujarat, Maharashtra and Uttar Pradesh, to enable them to take over the responsibility for the production of educational television programmes relevant to their specific needs. A Central Institute of Educational Technology has been set up for the production of programmes, training of personnel from the States, as well as providing the necessary guidance to the States for setting-up the production facilities.

The CIET is sharing the responsibility of producing ETV programmes for telecast via INSAT with Doordarshan on 50:50 basis. The temporary studios in three States viz. Bihar, Maharashtra and Gujarat are ready and ENG equipment is being provided so that some field based programmes could be produced by them. They will also assist CIET in dubbing the ETV programmes in their regional languages.

The Ministry of Education and Culture, in collaboration with the Department of Electronics, launched a Pilot Project for introducing computer literacy and studies in 250 Higher Secondary Schools in all States/Union Territories (except Andaman and Nicobar Islands, Dadra and Nagar Haveli and Lakshadweep) during 1984-85.

10+2+3 Pattern. The 10+2 pattern of school education has so far been adopted by 29 States/Union Territories and also by the schools affiliated to the Central Board of Secondary Education. The States of Haryana and Himachal Pradesh will introduce 10+2 system from the academic session 1985-86. Meghalaya, Nagaland and Mizoram have pre-university stage of two years after Class X. The States/Union Territories which have adopted 10+2 system so far are:-

1. Andhra Pradesh, 2. Assam, 3. Bihar, 4. Gujarat, 5. Jammu & Kashmir, 6. Karnataka, 7. Kerala, 8. Maharashtra, 9. Manipur, 10. Meghalaya, 11. Nagaland, 12. Orissa, 13. Sikkim, 14. Tamil Nadu, 15. Tripura, 16. Uttar Pradesh, 17. West Bengal, 18. Andaman & Nicobar Islands, 19. Arunachal Pradesh, 20. Chandigarh, 21. Dadra & Nagar Haveli, 22. Delhi, 23. Goa, Daman & Diu, 24. Lakshadweep, 25. Mizoram, 26. Pondicherry, 27. Madhya Pradesh, 28. Punjab, 28. Rajasthan.

Vocationalisation of higher secondary education is a major step in the reconstruction

tion of present educational system. Under the 10+2 pattern of school education, the following 12 States/Union Territories have adopted vocationalisation at the +2 stage: Andhra Pradesh, Assam, Gujarat, Haryana, Karnataka, Kerala, Maharashtra, Tamil Nadu, West Bengal, Andaman & Nicobar Islands, Delhi and Pondicherry.

The national population education programme launched by the Government of India w.e.f. April 1, 1980 is designed to introduce population education in the formal system of education with a view to creating in the younger generation an adequate awareness of the population programme and realisation in this regard of its responsibilities towards the nation is now being implemented in all the States/Union Territories except the Union Territories of Lakshadweep and Arunachal Pradesh. Jammu & Kashmir is likely to join this programme in the Seventh Five-Year Plan.

Research and Training. National Council of Educational Research & Training (NCERT), established on September 1, 1961, is registered under the Societies Registration Act (1860). The main objectives of the NCERT are to assist and advise the Ministry of Education and Culture in implementing policies and major programmes in the field of education, particularly school education.

Among multifarious activities the Council has taken up revision of secondary level syllabi and textbooks under a collaborative arrangement with the Central Board of Secondary Education.

Most of the States have already completed evaluation of textbooks from the standpoint of national integration and have also revised the textbooks. Efforts are being made to expedite the work in a few States where the progress has been slow.

The Council organises, every five years, national surveys of teacher education both at secondary and elementary levels. Work has been initiated on the Third National Survey of Elementary Teacher Education and Fourth National Survey of Teacher Education at the secondary level.

The Regional Colleges of Education under NCERT, Ajmer, Bhubaneswar, Bhopal and Mysore continued to organise various pre-service and inservice courses. The summer school-cum-correspondence courses that

have been introduced to clear the backlog of untrained graduate teachers also continued to be organised.

The NCERT established in April, 1984 the Central Institute of Educational Technology by the merger of erstwhile Centre for Educational Technology and the Department of Teaching Aids. The major functions of the Institute are designing of effective alternative learning systems to deal with problems in education, orientation and training in specialized areas such as radio, television, films, filmstrips, tapeslide programmes, low cost teaching aids, production of educational materials—mostly prototypes, research, experimentation and extension in educational technology.

Central Board. The Board of High School and Intermediate Education, Rajputana including Ajmer, Mewar, Central India and Gwalior was established in 1929 by a Resolution of the Government of India. In 1952, the Board was given its present name 'The Central Board of Secondary Education'.

The schools affiliated to the Board are located in all parts of the country and even abroad, giving the Board a place of pride in the field of school education. The schools affiliated to CBSE are expected to provide uniform school education cutting across State borders and linguistic areas. The underlying idea is to promote national integration through inter-state mobility of students. This arrangement also helps children of transferable persons who pursue uninterrupted studies.

In 1984 CBSE examinations, 2,11,106 candidates appeared.

An Open School was set up by the CBSE in 1979 for propagation of Distance Education in the country. It imparts secondary stage education through the use of Distance teaching techniques which include education through print material, personal contact programmes and other supportive services.

The Open School has been conducting examination for its students since 1982-83 leading to Secondary School Certificate of CBSE. The number of students enrolled with the Open School reached 8000 in 1984-85. During 1984-85, Open School has further rationalised its scheme of study both from academic and operational points of view.

Kendriya Vidyalayas. With the idea of encouraging the secondary schools having common syllabi and media of instruction for providing the facility of uniform education throughout the country for the children of transferable Central Government employees, including defence personnel, the scheme of Central Schools was approved by the Government of India in November, 1962. To start with, 20 Regimental Schools were taken over as Central Schools or Kendriya Vidyalayas during the academic year 1963-64. Subsequently, Kendriya Vidyalaya Sangathan was set up as an autonomous organisation to establish and run the Kendriya Vidyalayas.

With the opening of 49 new schools during 1984-85, at present the total number of Kendriya Vidyalayas is 499. The total number of students on roll in all Kendriya Vidyalayas was 3,57,727 (as on 1-8-1984).

Education up to class 8th is free in Kendriya Vidyalayas. The amount of tuition fee for higher classes is linked to the pay of the parents in case they are employed in Central Government or Central Public Sector Undertakings/Autonomous Bodies. In other cases, tuition fee at all flat rate is charged. However, students belonging to Scheduled Castes and Scheduled Tribes and children of teaching and non-teaching staff of Kendriya Vidyalayas are not charged any tuition fee.

Although Kendriya Vidyalayas are not residential schools, hostel accommodation is available in 13 schools.

Higher Education. Coordination and determination of standards in higher education is a subject in the Union list and is a special responsibility of the Central Government. This responsibility is discharged mainly through the *University Grants Commission* which was established in 1953 under an Act of Parliament. Seven Universities, commonly known as *Central Universities* are at present functioning under Acts of Parliament. Besides, the Central Government have established agencies for promotion and coordination of research efforts in specialised fields. There are four such national agencies at present, namely the *Indian Council of Social Science Research*, the *Indian Council of Historical Research*, the *Indian Council of Philosophical Research* and the *Indian Institute of Advanced studies*.

The UGC is at present providing assistance to 19 centres of Advanced Study and 62 Departments of Special Assistance in Science, Engineering & Technology and 10 centres of Advanced Study and 25 Departments of Special Assistance in Humanities and Social Sciences.

Central Universities. The seven Central Universities are Aligarh Muslim University, Aligarh, University of Delhi, Delhi, University of Hyderabad, Hyderabad, Jawaharlal Nehru University, New Delhi, North-Eastern Hill University, Shillong, Viswabhārati, Santiniketan and Benaras Hindu University, Varanasi.

Aligarh Muslim University. The number of students on rolls during 1984-85 is 16,190 which includes the enrolment in schools, colleges and the faculties of the university. During the year, the university awarded 25 Ph.D degrees and 28 M.Phil degrees.

University of Delhi. During the year 1984-85, there are 92,594 students on rolls in the regular courses offered by the university departments and colleges. The number of students on rolls as Non-collegiate Women students is 13,185, while the External Candidates Cell registered 18,528 as private candidates.

University of Hyderabad: During the year the university admitted 442 new students to various post-graduate programmes offered by it on the results of an all-India admission test.

Jawaharlal Nehru University: Entrance test for admission to the 1984-85 session was held at 20 centres throughout the country. Out of a total 11,682 applicants, 4790 actually took the test. From among the candidates who qualified in the test and were offered admission, 847 candidates belonging to 27 states and Union Territories in the country joined the university.

North-Eastern Hill University. The university has at present 16 post-graduate departments and four centres at Shillong. The Nagaland and Mizoram Campuses have four departments each. The College of Agriculture on the Mizoram Campus is being converted into a School of Agricultural Sciences.

Vishva-Bharati: The Vishva-Bharati Act was amended in 1984 to provide for a standing committee of the Academic Council, students council, etc. The amended Act came into effect on August 8, 1984.

The total student strength in the university during the year was 3427. The total strength of teachers was 504, of whom 45 are professors and 115 readers.

Banaras Hindu University. During the year the University introduced new courses leading to a Master's degree in Arts, Home Science, Journalism and Physical Education.

Institutes of Technology. The five Indian Institutes of Technology at Kharagpur, Bombay, Madras, Kanpur and Delhi were established as premier centres of education and training in engineering and applied sciences and to provide adequate facilities for post-graduate studies and research.

The Institutes conduct under-graduate programmes leading to Bachelor's degree in various fields of Engineering and technology. They also offer integrated Master's degree courses of five years' duration in Physics, Chemistry and Mathematics, two-year M.Tech. degree courses in various specialisations and one-year post-graduate Diploma courses in selected areas. In addition, the Institutes offer Ph.D. Programmes in different branches of Engineering, Science, Humanities and Social Sciences. There are also advanced centres of training and research in each institute in identified areas of specialisation.

The Government of India established three *Indian Institutes of Management* at Ahmedabad, Bangalore and Calcutta in the year 1962, 1972 and 1961 respectively.

On the recommendation of the Review Committee for IIMs, the fourth Institute in the Northern Region has been set up at Lucknow.

Regional Engg. Colleges. Fourteen Regional Engineering Colleges were set up one each in the major states during the Second and Third Plan periods to enable the country to meet the increased need for trained personnel during subsequent plan periods. The fifteenth college at Silchar (Assam) admitted the first batch of students in November, 1977.

While all the colleges offer first degree courses in Civil, Mechanical and Electrical Engineering, some of them also offer courses in Chemical, Metallurgical, Electronics, Mining and Architecture Engineering. Thirteen of these colleges are also conducting post-graduate courses. Of these, nine are conducting industry-oriented courses in specialised fields like Design and Production of high pressure boilers and accessories, Heavy machines for a steel plant, Transportation Engineering, Industrial and Marine Structure, Integrated Power system etc.

School of Planning and Architecture, New Delhi was established in July, 1955 as the School of Town and Country Planning to provide facilities for training in Rural, Urban and Regional Planning and to cater to the needs of Central, States and Local Departments of Town Planning. The Department of Architecture of Delhi Polytechnic was amalgamated with the School in October, 1959 and the School was given its present name of the School of Planning and Architecture.

A significant event in the development of this institution took place in 1979 when it was given the status of a 'Deemed to be University'.

153 Universities. With the setting up of Indira Gandhi National Open University in

IIT student strength 1983-84.

IIT	Under Graduate	Post Graduate	Research	Out-turn
Kharagpur	1,539	801	224	670
Bombay	1,441	630	-	617
Madras	1,244	563	567	578
Kanpur	1,194	426	311	449
Delhi	1,286	841	745	643

New Delhi and the Central University in Pondicherry, the number of Universities and University level institutions in the country has increased to 153. Among them the latest one is Thapar Institute of Engineering and Technology, Patiala declared as Deemed University.

Of these 102 are traditional universities while others are professional/technical institutions. There are 24 Agricultural Universities, 3 Medical Institutions and 10 Technical Institutions.

Following is the list of Universities and University level institutions established by an Act of Parliament or State Legislatures. The institutions classified as 'deemed universities' under the UGC Act also have been included.

1. Agra University, Agra; 2. Aligarh Muslim University, Aligarh; 3. Allahabad University, Allahabad; 4. All India Institute of Medical Sciences, New Delhi; 5. Amravati University, Amravati; 6. Andhra University, Visakhapatnam; 7. Andhra Pradesh Agricultural University, Hyderabad; 8. Andhra Pradesh Open University, Hyderabad; 9. Anna University, Madras.

10. Annamalai University, Annamalai Nagar; 11. Assam Agricultural University, Jorhat; 12. Avadh University, Faizabad; 13. Awadhesh Pratap Singh University, Rewa; 14. Banaras Hindu University, Varanasi; 15. Banasthali Vidyapith, Banasthali, Rajasthan; 16. Bangalore University, Bangalore; 17. M.S. University of Baroda, Baroda; 18. Berhampur University, Berhampur; 19. Bhagalpur University, Bhagalpur.

20. Bharatiya University, Coimbatore; 21. Bharathidasan University, Tiruchirappalli; 22. Bhavnagar University, Bhavnagar; 23. Bhopal University, Bhopal; 24. Bidhanchandra Krishi Vishwavidyalaya; 25. Bihar University, Muzaffarpur; 26. Birla Institute of Technology & Science, Pilani; 27. Birla Agricultural University, Ranchi; 28. University of Bombay, Bombay; 29. University of Bundelkhand, Jhansi.

30. University of Burdwan, Burdwan; 31. University of Calcutta, Calcutta; 32. Calicut University, Calicut; 33. Central Institute of English & Foreign Languages, Hyderabad; 34. Central University, Pondicherry; 35. Chandra Shekhar Azad University of Agriculture & Technology, Kanpur; 36. University of Cochin, Cochin; 37. Dakshina Bharat Hindi

Prachar Sabha, Madras; 38. Dayalbagh Educational Institute, Agra; 39. University of Delhi, Delhi.

40. Devi Ahilya Vishwavidyalaya, Indore; 41. Dibrugarh University, Dibrugarh; 42. Dr. Hari Singh Gour Vishwavidyalaya, Sagar; 43. Gandhiji University, Kottayam; 44. Gandhigram Rural Institute, Madurai; 45. Garhwal University, Srinagar; 46. Gauhati University, Guwahati; 47. University of Gorakhpur, Gorakhpur; 48. Govind Ballabh Pant University of Agriculture & Technology, Nainital; 49. Gujarat Agricultural University, Dantiwada.

50. Gujarat Ayurveda University, Jamnagar; 51. Gujarat University, Ahmedabad; 52. Gujarat Vidyapith, Ahmedabad; 53. Gulbarga University, Gulbarga; 54. Guru Ghasidas University, Bilaspur; 55. Gurukula Kangri Vishwavidyalaya, Haridwar; 56. Guru Nanak Dev University, Amritsar; 57. Haryana Agricultural University, Hissar; 58. Himachal Pradesh University, Shimla; 59. Himachal Pradesh Krishi Vishwavidyalaya, Palampur.

60. University of Hyderabad, Hyderabad; 61. Indian Agricultural Research Institute, New Delhi; 62. Indian Institute of Science, Bangalore; 63. Indian Institute of Technology Bombay; 64. Indian Institute of Technology, New Delhi; 65. Indian Institute of Technology, Kanpur; 66. Indian Institute of Technology, Kharagpur; 67. Indian Institute of Technology, Madras; 68. Indian School of Mines, Dhanbad; 69. Indian Statistical Institute, Calcutta.

70. Indian Veterinary Research Institute, Izatnagar; 71. Indira Kala Sangeet Vishwavidyalaya, Khairagarh; 72. Indira Gandhi National Open University, New Delhi; 73. Jadavpur University, Calcutta; 74. Jamia Millia Islamia, New Delhi; 75. University of Jammu, Jammu; 76. Jawaharlal Nehru Krishi Vishwavidyalaya, Jabalpur; 77. Jawaharlal Nehru Technological University, Hyderabad; 78. Jawaharlal Nehru University, New Delhi; 79. Jiwaji University, Gwalior.

80. University of Jodhpur, Jodhpur; 81. Kakatiya University, Warangal; 82. University of Kalyani, Kalyani; 83. Kameshwar Singh Darbhanga Sanskrit University, Darbhanga; 84. Kanpur University, Kanpur; 85. Karnatak University, Dharwad; 86. Kashi Vidyapeeth, Varanasi; 87. University of Kashmir, Srinagar; 88. University of Kerala, Trivandrum; 89.

Kerala Agricultural University, Trichur.

90. Konkani Krishi Vidyapeeth, Dapoli; 91. Kumaun University, Nainital; 92. Kurukshetra University, Kurukshetra; 93. Lalit Narayan Mithila University, Darbhanga; 94. University of Lucknow, Lucknow; 95. University of Madras, Madras; 96. Madurai Kamaraj University, Madurai; 97. Magadh University, Bodh Gaya; 98. Maharshi Dayanand University, Rohtak; 99. Mahatma Phule Krishi Vidyapith, Ahmednagar.

100. Mangalore University, Mangalore; 101. Manipur University, Canchipur, Imphal; 102. Marathwada University, Aurangabad; 103. Marathwada Krishi Vidyapeeth, Parbhani; 104. Meerut University, Meerut; 105. Mohanlal Sukhadia Vishwavidyalaya, Udaipur; 106. Mother Teresa Women's University, Kodaikanal; 107. University of Mysore, Mysore; 108. Nagarjuna University, Guntur; 109. Nagpur University, Nagpur.

110. Narendra Dev University of Agriculture & Technology, Faizabad; 111. North Bengal University, Darjeeling; 112. North Eastern Hill University, Shillong; 113. Orissa University of Agriculture & Technology, Bhubaneswar; 114. Osmania University, Hyderabad; 115. Punjab University, Chandigarh; 116. Patna University, Patna; 117. University of Poona, Poona; 118. Postgraduate Institute of Medical Education and Research, Chandigarh; 119. Punjab Agricultural University, Ludhiana.

120. Punjab University, Patiala; 121. Punjabrao Krishi Vidyapeeth, Akola; 122. Rabin-dra Bharati University, Calcutta; 123. University of Rajasthan, Jaipur; 124. Rajendra Agricultural University, Samastipur; 125. Ranchi University, Ranchi; 126. Rani Durgawati Vishwavidyalaya, Jabalpur; 127. Ravishankar University, Raipur; 128. Rohilkhand University, Bareilly; 129. University of Roorkee, Roorkee.

130. Sambalpur University, Sambalpur; 131. Sampurnanand Sanskrit Vishwavidyalaya, Varanasi; 132. Sardar Patel University, Vallabh Vidyanagar; 133. Saurashtra University, Rajkot; 134. School of Planning and Architecture, New Delhi; 135. Sher-e-Kashmir University of Agricultural Science & Technology, Srinagar; 136. Shivaji University, Kolhapur; 137. Shri Jagannath Sanskrit Vishwavidyalaya, Puri; 138. SNDT Women's University, Bombay; 139. South Gujarat University,

Surat.

140. Sree Chitra Tirunal Institute for Medical Sciences & Technology, Trivandrum; 141. Sri Krishnadevaraya University, Anantapur; 142. Sri Padmavati Mahila Viswavidyalaya, Tirupati; 143. Sri Sathya Sai Institute of Higher Learning, Anantapur; 144. Sri Venkateswara University, Tirupati; 145. Tamil University, Thanjavur; 146. Tamilnadu Agricultural University, Coimbatore; 147. Thapar Institute of Engineering and Technology, Patiala; 148. Tata Institute of Social Sciences, Bombay; 149. University of Agricultural Science, Hebbal.

150. Utkal University, Bhubaneswar; 151. Vidyasagar University, Midnapore; 152. Vikram University, Ujjain; 153. Vishva Bharati, Santiniketan.

Research. India is said to have the third largest number of scientific personnel in the world. Actually, as of 1980-81 there were only 1.5 million qualified scientists according to the Dept. of Science & Technology. Of these 290,000 scientists were unemployed. Of the rest, only 184,000 are actually employed in research or development institutes. Sixty-four per cent of these are engaged in non-technical administrative sections.

The total number of those participating in research thus comes only to 60,000 of whom 11 per cent are Ph.D.s. This works out at 0.1 scientist per 1000 people in India, compared to 0.61 in Korea, 2.8 in USA and Britain and about 5 in USSR (1978-79). Besides, India spent only 0.66 per cent of her gross national product in research and development, of which 16 per cent went to basic research and 8 per cent to allied work, the rest 76 per cent being spent on applied or experimental research.

Published papers which, in a way, indicate the progress of research are very meagre in India. In 1971 Indian scientists published only 5144 papers. Much of this was routine stuff and many papers published in scientific journals were commonplace. In fact, except for a handful of outstanding scientists like S.N. Bose, C.V. Raman, Ramanujam and others, Indian scientists have not contributed anything worthwhile to scientific knowledge. One scientist estimates that the total contribution of Indian scientists to international science literature is not more than 0.3 per cent. This is quite poor.

The world of Indian science is dominated by three academies. 1. *Indian National Science Academy, Delhi*. This is the Royal Society of India and the focal point for liaison with the International Council of Scientific Unions. 2. *The Indian Science Congress Association, Calcutta*. This is another god-father. 3. *Indian Institute of Science, Bangalore*, is the third. This multiplicity of top organisations does not reflect scientific effulgence or ebullience but competition and strife among top-ranking scientists.

All scientific organisations in India are pyramidal in structure and functioning—a satrap at the top controlling by strings the vassals below. The landscape of Indian science is dotted with such pyramids—agriculture, atomic energy, space, medical research etc. with less than a dozen satraps ruling their respective satrapies. Only those at the top get the limelight and the plums in the pudding while thousands of talented scientists labour like slaves in the dismal dungeons below.

Research Agencies: The responsibility for research in India is shared among various councils, committees and departments, all of them functioning under the aegis of the Central or State governments. Important among them are: The Council of Scien-

tific and Industrial Research (CSIR), the Indian Council of Medical Research (ICMR), the Indian Council of Agricultural Research (ICAR), the Central Council for Research in Indian Medicine and Homeopathy, the National Committee on Environmental Planning and Co-ordination (NCEPC), the Department of Atomic Energy (DAE) and the Department of Space (DOS).

The CSIR controls thirty National Laboratories and Research Centres including two museums.

The Indian Council of Medical Research is mainly responsible for the coordination of research work in 22 national institutions and several regional institutes.

The Central Council for Research in Indian Medicine and Homeopathy, established as an autonomous body, is engaged in intensive research in the different fields in Ayurveda, Unani, Siddha and Homeopathy and Yoga. The Central Council has established 15 full-fledged research institutes and about 112 research units.

The Indian Council of Agricultural Research functions through a network of 30 National and Central scientific institutes, 21 Agricultural Universities and 52 all-India co-ordinating agencies and 4 Project Directorates.

Challenges to Higher Education

Dr. Madhuri R. Shah:

Higher Education in India has experienced exceptionally high rates of growth ever since the country attained its Independence 38 years ago. The number of colleges and universities since 1950-51 has increased from around 700 and 18 to more than 5200 and 140 respectively.

Around 100 new colleges start functioning every year which means one new college every 3 or 4 days. The enrolments are currently rising at about 7% per annum signifying a doubling of the statistic every 10 years. It is estimated that more than 4.8% of

the country's population in the age group 17-23 is currently enrolled in our institutions of higher learning.

A new educational policy is on the anvil. The Prime Minister has been very keen on revitalising the entire system to give it greater relevance and meet the needs of the individual and national development. The educational policy for tomorrow must have four basic contents—ethical, social, academic and vocational. At the ethical level a student must develop a passionate commitment to Truth, Beauty and Goodness (Satyam-Shivam-Sundaram).

At the social level, to achieve national integration, he must learn to rise above the prejudices of caste, creed, community, wealth and privilege. To be a useful member

Excerpts from the A.D. Shroff Memorial Lecture delivered in Bombay on 28 October, 1985. Dr. (Mrs) Madhuri R. Shah is the Chairman of the University Grants Commission since 1981. She is a former Vice-Chancellor of the SNDT Women's University.

Kerala Girls Top

Enrolment of women students in universities and colleges is the highest in Kerala (49.6%) followed by Delhi (42.5%), Jammu and Kashmir (42.3%) and Punjab (41.6%). The percentage was the lowest in Bihar (15.3%)

According to University Grants Commission annual report for 1983-84, the enrolment of women students during 1983-84 was 9.77 lakh as against 8.80 lakh during 1982-83. The percentage of women students increased from 28.1% during 1982-83 to 29.1% in 1983-84. At the postgraduate level, the enrolment of women was 30.8% of the total enrolment.

The student enrolment in universities and colleges increased from 31.33 lakh in 1982-83 to 33.59 lakh in 1983-84. The rate of growth was 7.2 per cent against 6.1 per cent in the previous year. The number of students in the university departments was 6.12 lakh and in colleges 27.47 lakh.

Enrolment in the faculty of Arts constituted 39.1% of the total enrolment. In the faculties of Science & Commerce, the percentage was 19.8 and 22.4 respectively. Enrolment at the first degree level was 29.32 lakh (87.3%); at postgraduate level 3.31 lakh (9.8%); at research level 0.43

lakh (1.3%); and at diploma and certificate level 0.53 lakh (1.6%). Compared to 1982-83, the major increase was only at the first degree level.

The number of teachers increased to 2.20 lakhs. Of these, 0.49 lakhs were in the university departments, university colleges and the rest in the 'affiliated colleges'. Of the 48694 in the universities, 4860 were professors, 11,189 were readers, 30,630 were lecturers and 2015 were tutors and demonstrators. In the affiliated colleges, the number of senior teachers was 20,186 and 1,44,293 were lecturers.

During 1983-84, two institutions, namely, the Banasthali Vidyapeeth, Banasthali (Rajasthan) and the Indian Veterinary Research Institute, Izatnagar, Bareilly were declared "Deemed Universities" under section 3 of the UGC Act.

Two new universities—Indira Gandhi National Open University, New Delhi and Central University Pondicherry were established in 1985.

With these, the number of universities and university-level institutions in the country has risen to 153. The number of affiliated colleges increased from 5039 to 5246 in 1984-85.

of the society he must learn to reconcile his personal interests with the larger national interests. At the academic level, instead of acquiring knowledge merely by memorising, he should develop a life-long thirst for knowledge—to learn, to think, to analyse and to conclude.

Above all, there must be an abiding commitment to reason and rationality. Vocationally he must learn to earn, by acquiring a trade for which he has a natural aptitude. It is not mere money but better management and execution of educational policy that can give true content and meaning to education.

We are now at the gateway of a social and economic revolution which, we expect, will transform the country and help build a thriving, prosperous and united country. The

factories we build, the steel mills we erect the hydroelectric and thermal power projects we set up, all need highly trained personnel. We need institutions for training the personnel required to man these projects. The most essential step to enable us to move forward is the proper training of our youth.

The Education Commission has pointed out that the development of human resources through a properly organised programme of education must proceed side by side with the development of physical resources through the modernisation of agriculture and rapid social and economic change in order to improve the standard of living of our people.

The University examination system in the country has practically broken down and is

many places university examinations no longer serve the purposes of evaluation and certification, they were designed to serve. In other words, our examinations have become a big farce.

Leakage of question papers, mass copying, tampering with marks, granting of grace marks on block when overall pass percentage is seen to lag behind the popular expectation, and other malpractices have become an everyday affair, if not the order of the day. University examinations have lost their credibility at home and abroad, for which the universities themselves must bear the full responsibility.

I venture to suggest that the main elements of one possible strategy to deal with the present situation could be as follows:

1. The universities and colleges in each state may consider having a common admission examination, smaller states joining, if necessary, the neighbouring states for this purpose. In each case, the cut-off point should be sufficiently high to exclude those who are lacking in ability and interest needed to pursue higher education.
2. All university examinations should be thrown open to private candidates to

provide easy access to those who are seriously motivated.

3. The needs of those who are interested in higher education at any cost should be met by private institutions without any support from public funds.
4. Admission to post-graduate course should be entirely by merit and the number of seats should be fixed strictly according to facilities available. Introduction of common selection tests by the ICSSR, IITs and the UGC for the award of its research fellowships has had favourable results. The extension of a similar common merit-based device to screen admissions at the under-graduate levels will not only make for better co-ordination but also do a world of good to the health and vitality of higher education.
5. Affiliation should be available only to those colleges which meet adequately the conditions of recognition. In the case of existing sub-viable institutions the possibility of converting them into extension centres, community colleges with popular vocational courses and contact centres for the open university courses should be explored. Failing that such institutions should derecognised.

125. JOBS: LENGTHENING QUEUE

Inspite of integrated development plans and drive for industrialisation, the number of unemployed young men and women has been growing in alarming proportions. The total number of work-seekers in the line register of Employment Exchanges at the end of 1984 was 235.47 lakh, 7.3 per cent higher than the number at the beginning of the year. The educated unemployed in the country is around 12 million today.

The Seventh Plan is seized with the problem. The plan seeks to ensure that the growth of employment opportunities is faster than that of the labour force. Over the Seventh Plan, the employment potential is expected to increase by 40 million standard person years.* The employment potential will grow at 4 per cent per year as compared to the expected growth of 2.6 per cent per year in the labour force. The Plan would

provide fuller employment in rural areas.

Plan objective. In his preface to the Seventh Five-Year Plan, the Deputy Chairman of the Planning Commission, Dr. Manmohan Singh, asserts that the major objective of the Plan is to ensure that the growth of employment opportunities is faster than the growth of the labour force. And the Prime Minister told the Parliament in December 1985 that for the first time in the history of Five-Year Plans, the backlog of unemployment would be wiped out during 1985-1990.

* A standard Person-Year is equivalent to work for 8 hours per day for 273 days

According to one sanguine estimate, the country would achieve near full employment by 2000 A.D.

The Seventh Plan employment projections are based on the premise that during the Sixth Plan period (ending on March 31, 1985), there had been an increase in employment of the order of 35.60 million standard person years (SPY) which was in excess of the target by 1.32 million SPY. The accretions to employment opportunities are attributed to the special employment programmes reinforcing the Plan growth strategy, such as the Integrated Rural Development Programme (IRDP), the National Rural Employment Programme (NREP) the Rural Landless Employment Guarantee Programme (RLEGP), the scheme of Training Rural Youth for Self-employment (TRYSEM) and the scheme for providing self-employment to educated unemployed youth, apart from the Food for Work schemes implemented by a few States.

The projected increase in employment during the Seventh Plan period is 40.356 million SPY of which the agricultural sector would provide about 18 million SPY, while the industrial sector by contrast would provide only about 7 million SPY. There is a realistic assumption in the Plan that the lion's share of new investment in industry will be directed toward modernisation and the adoption of capital intensive new technology.

The real surge in employment will occur in the services sector—construction, communication, education and health and to an extent in transport—with a targeted increase of about 15 million SPY.

Employment Generation. The Sixth Plan estimated that at the beginning of

the Plan, i.e., in March, 1980, about 11 million persons were usually unemployed in the age group of 15 and above. About 34 million persons were expected to join the labour force during the period 1980-85. Taking the backlog and the freshers together, about 46 million persons have, therefore, been looking for work during the period of 1980-85.

It has been estimated that as a result of implementation of the various programmes included in the plan, about 32.44 million Standard Person Years (SYP) of employment opportunities would be generated during 1980-85. The actual number of beneficiaries would, however, be much more since not every member of the labour force would be requiring full time work during the entire year and against each Standard Person Year generated, more than one person would be benefited.

The Approach Paper to the Seventh Five-Year Plan states that the growth of employment has generally been in consonance with the assumptions made in the plan.

The organised sector registered a growth of 2.7 per cent in employment during 1981-82 and 2.0 per cent during 1982-83. Provisional estimates for March, 1984 indicate that growth in employment during 1983-84 had been slower, being of the order of 1.4 per cent.

While the employment in the public sector increased by 2.6 per cent during 1983-84, it decreased by 1.2 per cent in private sector.

Employment in all branches of the public sector recorded a higher level in March, 1984 compared to March, 1983. The highest rate of growth was attained by the Quasi-Government establishments under Central

Employment in the Organised Sector

At the end of	Employment (in lakh)			Percentage change		
	Public Sector	Private Sector	Total	Public Sector	Private Sector	Total
1	2	3	4	5	6	7
March, 1982	159.5	75.5	234.9	3.0	2.0	2.7
March, 1983	164.3	75.2	239.5	3.0	-0.3	2.0
March, 1984	168.6	74.3	242.9	2.6	-1.2	1.4

Quasi-Government establishments under State Governments (3.2 per cent). Central Government establishments (2.6 per cent). State Government establishments (2.1 per cent) and Local Bodies (0.6 per cent). The details are presented in the following table:

Branch of Public Sector	Number of employees (in lakh)		Percentage change during	
	31st Mar. 1983	31st Mar. 1984(P)	Mar.1982/ Mar.83	Mar.1983/ Mar.84
1	2	3	4	5
Central Govt.	32.64	33.50	0.5	2.6
State Govt.	60.16	61.40	2.8	2.1
Quasi-Govt. (central)	30.07	31.48	5.1	4.7
Quasi-Govt. (state)	20.34	20.99	4.3	3.2
Local Bodies	21.11	21.24	3.9	0.6
	164.32	168.61	3.0	2.6

P=Provisional

Employment of Women. The employment of women in the organised sector increased by 2.1 per cent from 29.93 lakh at the end of March, 1983 to 30.55 lakh at the end of March 1984 (Provisional). The growth rate was 4.5 per cent in public sector but there was a decline of 0.1 per cent in the private sector.

In addition to various sectoral development programmes a number of programmes of direct productive benefit to the poorer sections of society such as the Integrated Rural Development Programme (IRDP), Training of Rural Youth for Self-employment (TRYSEM) and the National Rural Employment Programme (NREP) have been launched by the Government, which have had a substantial impact on employment generation.

Employment Service. At the end of 1984, the National Employment Service consisted of a net-work of 745 Employment Exchanges in the country, compared to 726 at the end of 1983. This net-work included 79 University Employment Information and Guidance Bureaux (UEIGBx), 16 Professional and Executive Employment Exchanges, 7 Colliery Exchanges, 10 Project Employment Exchanges, 22 special Employment Ex-

changes for Physically handicapped and one Special Exchange for Plantation Labour.

Registration of workseekers and their placement against vacancies notified by employers is one of the main activities of the Employment Exchanges. The following statement gives a general idea of the work done in this regard during 1984 in comparison with 1983.

(Lakh)		
Activity	1983	1984
1	2	3
Registrations	67.56	62.19
Vacancies notified	8.26	7.08
Submissions made	60.94	57.04
Placements effected	4.86	4.07

The total number of workseekers on the live register of Employment Exchanges at the end of 1984 was 235.47 lakh, 7.3 per cent higher than the number at the beginning of the year.

Educated Workseekers. Nearly half of the registered workseekers are educated (matriculates and above). The number of educated workseekers at the end of 1983 was 111.56 lakh compared to 97.69 lakh a year earlier. This number increased further to 118.92 lakh by the end of June, 1984.

(Lakh)

Educational level	Registrations		Placements	
	1982	1983	1982	1983
1	2	3	4	5
Matriculates	14.79	17.74	0.86	0.96
Above Matriculation but below Degree	7.31	9.15	0.34	0.39
Graduates and Post-graduates	5.27	6.52	0.47	0.46
All educated workseekers	27.37	33.41	1.67	1.81

During the period January-June, 1984 the number of matriculates on the live register increased from 63.74 lakh to 68.10 lakh, that of persons who attained an educational level of above matriculation but are not graduates from 28.14 lakh to 29.44 lakh and that of graduates and post-graduates from 19.68 lakh to 20.68 lakh. The following statement presents a review of the employment assistance rendered by the Employment Exchanges to the educated workseekers during 1983 in comparison with 1982.

During January-June, 1984 a total of 16.18 lakh educated workseekers were registered and 0.93 lakh were placed.

The Employment Exchanges (Compulsory Notification of Vacancies) Act, 1959, enforced with effect from 1960, applies to all establishments in the public sector and such establishments in the private sector as are engaged in non-agricultural activities and employing 25 or more workers. Under the Act, it is obligatory for the employers to notify vacancies (other than those exempted in the Act) occurring in their establishments to the prescribed Employment Exchanges and to render certain periodic returns on employment and vacancies in their establishments.

The Act covered 1.64 lakh of establishments at the end of March, 1984, as against 1.60 lakh at the end of March, 1983. Of these, 1.22 lakh establishments were in the public sector and 0.42 lakh in the private sector.

Central Employment Exchange (CEE) Delhi: Under the Employment Exchanges (Compulsory Notification of Vacancies) Act, 1959, and the Rules framed thereunder, all vacancies of a scientific and technical nature in the Central Government carrying a basic pay of Rs. 425 and above are to be notified to the Central Employment Exchange, Delhi, which circulates the vacancies to various Employment Exchanges in the country and, if necessary, advertises them in the newspapers.

During the period January to December, 1984, a total of 7,883 vacancies were notified to the Central Employment Exchange which were circulated to all the Employment Exchanges in the country for sponsoring suitable applicants. Out of these 1,245 vacancies were reserved for scheduled castes and 834 for scheduled tribes. These vacancies were notified by 1,031 employers, out of which 984

were Central Government Offices and 47 Quasi-Government and other Public Sector Undertakings. In addition, 1,497 requests were received from different Employment Exchanges for wider circulation of vacancies for which suitable candidates were not available with the local Employment Exchanges.

The total number of establishments covered under the programme was 2.19 lakh on 31st March, 1984.

Assistance to Women. Employment Exchanges continued to pay special attention to the needs of the women jobseekers registered with them. The number of the women on the Live Register of the Employment Exchanges was 40.02 lakh at the end of 1984, compared to 35.82 lakh at the end of December, 1983. During the year 1984, the Employment Exchanges placed 56.4 thousand women in employment, as against 65.6 thousand during 1983.

To offer better services to the women applicants in the matter of their registration, etc. separate counters have been opened for them in a majority of Employment Exchanges. To safeguard the interests of women applicants further, the States/Union Territory Governments have been advised to consider appointment of a lady officer in all Employment Exchanges which have two or more officers.

The State/Union Territory Governments have also been advised to consider inclusion of at least one person as representative of women in the Advisory Committees attached to Employment Exchanges, so that they can offer suggestions for welfare of women applicants.

Apprenticeship. The Apprentices Act, 1961, was enacted in December, 1961, and the implementation of the training programme under the Act commenced with effect from 1-1-1963. Initially the Act envisaged the training of trade apprentices to meet the needs for skilled workers in various trades/occupations. The training of graduate and diploma holders in Engineering/Technology as graduate/technician apprentices was brought within the purview of the Apprentices Act through an amendment in 1973.

As on 31st December, 1984, the number of apprentices undergoing training in the Cen-

44 Million Child Labourers

Some 44 million children are in India's labour force and one-sixth of them belong to the tender age, according to an all-India survey sponsored by the Ministry of Labour.

Every third household has a working child and every fourth child in the age group of five to 15 is employed, according to the labour survey.

The survey, which covered the whole of India except the north-east, was carried out by the Baroda-based Operations Research Group (ORG).

The survey said that the number of working children has been increasing steadily despite the 1979 recommendation by the Gurupadaswamy committee for a minimum statutory age of 15 for working children in any occupation,

Working as domestic hands or in family business, the children are mostly illiterates and a majority of them work for more than seven hours a day without fixed timings.

Sixty-two per cent of the working children are adolescents, 22 per cent are mid-aged and the rest are of tender age, it said. Females outnumber male working children.

Both in urban and rural areas, the majority of children are household workers, while family business stood second.

"As high as 83 per cent of tender age children in urban areas are found working for seven hours or more per day, a proportion unsurpassed by children from the rest of the age group," the survey noted.

While not all the children worked for money, 52 out of every 1000 working children were wage earners who supplemented family income.

Abject poverty and absence of regular income drive the children to the labour market, according to the survey which called for a human approach to the problem "as a total ban on employment of child labour will be unrealistic."

In its recommendations to the Labour Ministry, the survey called for prohibition of any "laborious" or risky task to a child irrespective of the wages or duration of the task.

It has recommended restriction on age and maximum time limit of three hours a day for working children.

The survey also urged Labour Ministry to launch a plan whereby parents of working children would be given help and guidance to bring up the children without driving them to work.

It has also suggested non-formal education and establishment of "working children's homes" for recreation and health.

tral, State and Private Sector Establishments was 1,31,807. Care has been taken to ensure that the SC/ST, Minorities, Physically Handicapped and Women get a fair deal in the recruitment of apprentices.

Out of 1,31,807 trade apprentices undergoing training as on 31st December, 1984, the number of apprentices belonging to these categories was 40,863 viz. SC-12,609, ST-3,820, Minorities-20,848, Physically Handicapped-495 and Women -3,091. So far, 217 category of industries have been specified to train apprentices in 138 designated trades

under the Act. 3 trades have been deleted from the list.

Approval of the Central Apprenticeship Council and the National Council for Vocational Training has been obtained to designate the following new trades: (1) Painter (General) (2) Stockman (Dairy) (3) Attendant Operator (Dairy) (4) Insulator Maker Machine Operator (Ceramic) (5) Pump Mechanic (6) Creel Boy-cum-Warper (7) Back Sizer-cum-Front Sizer

Labour Policy. The labour policy in India derives its philosophy and content from

the Directive Principles of the State Policy, as enshrined in the Constitution and has been evolving in response to the specific needs of the situation and to suit the requirements of planned economic development and social justice. A large number of legislative enactments in the field of social security, safety and welfare, etc. were passed/improved upon after 1947.

During 1984-85 the four Central Acts were amended, namely, The Industrial Disputes (Amendment) Act, 1984, The Payment of Gratuity (Amendment) Act, 1984, The Payment of Gratuity (Second Amendment) Act 1984, The Workmen's Compensation (Amendment) Act, 1984, The Employee's State Insurance (Amendment) Act, 1984. Many other legislative proposals were in various stages of consideration.

In 1982 the Prime Minister announced a new 20-Point Programme. The Ministry of Labour is responsible for two items of this programme, namely, Items 5 and 6. Item No. 5 relates to the review and effective enforcement of minimum wages for agricultural labour, while Item No. 6 is concerned with the rehabilitation of the bonded labour. During the year 1984-85, the Ministry of Labour continued its efforts to bring about effective enforcement of minimum wages for agricultural workers in all the States and the Union Territories.

Bonded Labour. With a view to supplement the efforts of the State Governments in rehabilitation of bonded labourers, the Ministry of Labour had launched a Centrally Sponsored Scheme in 1978-79, under which the State Governments are provided Central financial assistance on matching grant (50:50) basis for the rehabilitation of bonded labourers. The scheme envisages provisions of Central financial assistance upto a ceiling limit of Rs. 4,000 per bonded labourer, half of which is given as central share.

During 1984-85 the Planning Commission, in consultation with the State Governments concerned, had initially fixed a target of 30,636 bonded labourers in respect of 10 States. Subsequently the Planning Commission has revised the target to 31,326. As against this, the State Governments have reported rehabilitation of 14,606 bonded

labourers during the period from April 1984 to January, 1985.

Minimum Wages. While in the early years of industrialisation, labour policy was pre-occupied mainly with the organised sections of the labour force, greater attention is now being paid to the interests of the workers in the unorganised sector without detracting from the concern of Government for the improvement of real earnings and work conditions of those in the organised sector.

The Minimum Wages Act, 1948, Contract Labour (Regulation and Abolition) Act, 1970, the Inter-State Migrant Workmen (Regulation of Employment and Conditions of Services) Act, 1979, the Bonded Labour System (Abolition) Act, 1976, the Beedi and Cigar Workers (Conditions of Employment) Act, 1966, the Beedi Workers' Welfare Fund Act 1976, etc. have been the main instruments for safeguarding the interests of the workers in the unorganised sector.

Strikes, Lockouts. The Labour Relations Monitoring Unit in the Ministry of Labour continued to monitor information on industrial relations throughout the country. During 1984, out of a total of 410 cases of strikes and 100 lockouts reported to the unit, 355 strikes ended and 89 lockouts lifted as a result of prompt preventive action taken both by the Central and State Governments. Besides, a number of cases relating to industrial disputes and labour unrest raised by Members of Parliament in their letter to the Union Labour Minister were also pursued with the State Governments and Central Ministries.

There was a marked improvement in the overall industrial relations situation with the number of mandays lost due to strikes and lockouts declining from 31.64 million in 1983 to 22.89 million in 1984 (January to September).

In the field of Social Security, the main endeavour has been to enlarge the coverage of the existing Social Security Schemes/Laws and to effect suitable improvements in the benefits provided. The Government has accordingly done away with the existing wage limit of Rs. 1000 per month for coverage under the Workmen's Compensation Act with effect from 1-7-1984 and the Act is now

applicable to all the employees employed in specified hazardous employments.

The wage limit for coverage under the Payment of Gratuity Act and the Employees' State Insurance Act have been raised from Rs. 1,000 to Rs. 1,600 per month with effect from 1-7-1984 and 27-1-1985 respectively. During the year, the Employees' State Insurance Act was extended to 27 new centres covering about 31,000 additional employees and the Employees' Provident Fund Act was extended to about 2 lakh additional employees in the various new and existing covered establishments.

Compensation. The rates of compensation payable under the Workmen's Compensation Act, 1923 have been suitably enhanced with effect from 1-7-1984. The minimum amount of compensation for permanent disablement has now been fixed at Rs. 24,000 (as against the previous amount of Rs. 10,080) and that for death at Rs. 20,000 (as against the previous amount of Rs. 7,200).

The maximum amount of compensation for permanent total disablement can now go upto Rs. 1,14,000 (as against the previous amount of Rs. 42,000) and for death upto Rs. 31,000 (as against the previous amount of Rs. 30,000), depending on the wage and the age of the workman at the time of disablement/death.

The quantum of family pension under the Employees Family Pension Scheme framed under the EPF Act has also been enhanced with effect from 1-4-1985. The increase being allowed is Rs. 60 per month for those drawing pension upto Rs. 100 per month, Rs. 75 for those drawing pension upto Rs. 100 to Rs. 200 and Rs. 90 to those drawing pension above Rs. 200. With these increases, the minimum amount of pension payable under the Employees' Family Pension Scheme stands raised from Rs. 66 to Rs. 126 per month.

Emigration. The Ministry of Labour is administering the work relating to emigration clearance for overseas employment on contract basis with effect from August, 1981, consequent on the reallocation of this work, which was originally handled by the Ministry of External Affairs. The Emigration Act of 1922 was repealed by the Emigration Act, 1983. This new Act, which came into force on

Jobless Doctors, Engineers

There were 2.15 lakh medical and 27,000 engineering graduates and post-graduates on the live registers of employment exchanges as on December 31 1984, Labour Minister T. Anjiah told Bhuvnesh Chaturvedi in the Rajya Sabha. He told T. Chandrasekhar Reddy that according to the mid-term appraisal to the Sixth Five-Year Plan, 32.44 million standard persons years of employment opportunities were to be generated during 1980-85.

To another question Mr. Anjiah said the total number of employees affected by closure of cotton textile mills as on May 31, 1985 was 95,415.

(UNI: Aug. 3, 1985)

30th December, 1983 is based on the guidelines enunciated by the Supreme Court of India and a set of consequential administrative orders being followed since March, 1979.

The Act and Rules contemplate a system of registration of recruiting agents and grant of permits to employers (both Indian and foreign) seeking to make direct recruitment. The entire structure of the Act and the Rules framed thereunder have been formulated to offer greater protection to the migrating workers who wish to avail themselves of job opportunities in foreign countries.

Adequate penal measures have been prescribed in the Act for curbing exploitative recruitment practices and for fostering a system of dual responsibility on the part of the agents and employers. The introduction of an Emigrants' Welfare Fund in order to provide legal and other financial aid to intending emigrants as also returning emigrants is on the anvil.

Workers in Management. It is the endeavour of the Government that workers' participation in Management should become a vehicle of transforming the attitudes of both employers and workers for establishing a cooperative culture which may help in building a strong, self-confident and

self-reliant country with a stable industrial base.

In the light of the reviews taken and experience gained so far, Government introduced a new comprehensive scheme of workers' participation in the central public sector undertakings and the same was notified on 30th-December, 1983. The scheme envisages workers' participation in management at the shop floor and the plant level in all the central public sector undertakings.

The Mines Act, 1952 was amended in 1983. This would enable the transfer of management of rescue services in coal mines to the mine managements. Action has been initiated to amend the Coal Mines Regulations, Metalliferous Mines Regulations, Mines Rules and Coal Mines Rescue Rules in the light of the Amendment Act of 1983.

Government issued Oil Mines Regulations,

1983 by invoking provision of Mines Act, 1952 which empowers the Government to make regulations without prior publication in emergent cases. The Oil Mines Regulations, 1983 were replaced by the Oil Mines Regulations, 1984 on 26th October, 1984. The new regulations contain detailed precautions against blowouts and fire which are the most serious hazards in oil fields.

In the light of the 1984 Bhopal Gas tragedy, the Govt. has been reviewing its policy on industrial safety.

Government is also considering amendments to the Factories Act so as to make the law more effective and the employer and worker more conscious of the safety requirements and carry out their functions in such a manner that industrial accidents are brought to a minimum and occupational diseases checked.

126. HEALTH FOR ALL

India is committed to the goal of 'Health For All' by 2000 AD through the provision of comprehensive primary health care services. The national health policy unanimously adopted by the Parliament in 1983 emphasises the preventive, promotive and rehabilitative aspects of health care and seeks to provide primary health care to the population even in the remotest areas, particularly the weaker and deprived sections of the society.

The Union Ministry of Health and Family Welfare plays a vital role in the Governmental efforts to enable the citizens to live a healthier and better life. Under the Constitution, the item public health and sanitation and hospitals and dispensaries is in the State list.

The items viz., population control and family planning, medical education, adulteration of food stuff and other goods, drugs and poisons, medical profession, vital statistics including registration of births and deaths and lunacy and mental deficiency are in the Concurrent List.

Family Welfare. The Ministry has been implementing many programmes of national importance viz., family welfare, primary health care services, prevention and control of diseases, etc., which form the main plank of India's developmental effort. It has many Centrally sponsored schemes which

are implemented through States. It has many Central sector schemes.

The Family Welfare Programme is fully funded by the Central Government as per the patterns approved by it and is implemented through the States. The administration and the implementation of this Programme is organised through an integrated structure of health and family welfare services in the country.

The Ministry of Health and Family Welfare consists of the Department of Health and the Department of Family Welfare.

Health Plans. For the Annual Plan 1984-85, an outlay of Rs. 537.15 crore was provided both under the Central and States Union Territories Plans, as against an outlay of Rs. 484.02 crore and anticipated expenditure of Rs. 484.35 crore during 1983-84.

The training of uni-level health worker

into multi-purpose workers lagged behind to some extent and the balance of 36 districts would be covered during 1984-85.

So far, 105 medical colleges and the Postgraduate Institute, Chandigarh, have accepted the scheme for reorientation of Medical Education. Under the existing pattern, assistance for the implementation of the first phase of the scheme is released at the rate of Rs. 4.79 lakh per medical college, for covering three community development blocks.

In addition, 318 mobile clinics (imported under the U.K. Aid Programme) have been provided free of cost to 106 medical colleges at the rate of three clinics per college. These clinics are highly sophisticated and are well equipped.

Communicable Diseases. The modified plan of operation for control of *Malaria* was continued during 1984-85. The incidence of malaria has declined from 6.5 million cases in 1976 to 2.18 million cases in 1982, during which period there has been an extended coverage of cases as reflected by an increase in the number of blood smears examined, from 55 million in 1976.

Under the National *Filaria* Control Programme, 20 control units, 56 clinics and four survey units have been established from 1979-80 and upto the end of 1983-84.

National *Leprosy* Eradication Programme is being funded 100 per cent by the Centre with effect from 1-4-1981. 3.92 lakh additional cases were detected and 3.74 lakh cases brought under treatment till Feb. 1984 during the year 1983-84 raising the overall cases balance on record to 30.72 lakh and cases under treatment to 28.86 lakh after accounting for 2.26 lakh cases discharged after cure/disease arrest/died or left.

392 leprosy control units, 655 urban leprosy centres, 6970 Survey, Education and Treatment (SET) centres and about 33,000 leprosy beds were set up under the programme upto the end of March 1984. The pilot project for the multi-drug regimen initiated in six districts in the country with SIDA assistance has been in progress.

Under the *TB* control Programme, detection and treatment of new TB cases based on targets assigned to States/UTs initiated with effect from 1982-83 is being pursued with vigour. 10.81 lakh cases were detected and

brought under treatment during 1982-83.

Against the set target of detecting another 12.50 lakh cases during 1983-84 it is expected that about 11.75 lakh new cases would be detected.

The programme for strengthening of *ophthalmic treatment* facilities initiated under the National control programme was continued during 1983-84. Against a set target of 12.50 lakh cataract operations for 1983-84, 7.8 lakh operations were reported to have been performed upto February 1984.

Cancer Research. Facilities for Cancer diagnosis and treatment have been developed in almost all major hospitals attached to the Medical Colleges and other Institutions.

Under the National Programme for control of Cancer, selected institutions at Ahmedabad, Bangalore, Calcutta, Cuttack, Delhi, Gauhati, Gwalior, Madras and Trivandrum, which have been recognised and are being developed as Regional Centres for Cancer Research and Treatment continued to receive financial assistance during the year.

Another Regional Centre, viz. The Tata Memorial Centre, Bombay, was financed by the Department of Atomic Energy. Central assistance for Cobalt Therapy Units which was hitherto Rs. 10 lakh has been raised to Rs. 12 lakh with effect from 1-4-83.

Efforts are continuing to procure sophisticated equipments like Cat Scanners and Linear Accelerators for the Regional Centres in order to equip them properly. The Regional Cancer Centre at the Cancer Institute, Madras, has installed another sophisticated machine known as Thermo-trone RF.8 which is a new development in the treatment of Cancer.

During the 6th Five Year Plan (1980-85), the Planning Commission had allocated an amount of Rs. 11.50 crore for Cancer Control and Treatment out of which Rs. 115 lakh in 1980-81, Rs. 230 lakh in 1981-82, Rs. 375 lakh in 1982-83, Rs. 250 lakh in 1983-84 and Rs. 200 lakh were provided in 1984-85.

Red Cross Society. The Indian Red Cross Society was formed in 1920. It was constituted for the administration of the various funds and gifts received for the purpose of medical and other aid to the sick and

wounded and other similar purposes, both during war and peace.

Various facets of its activity include Maternity and Child Welfare, provision of relief for the mitigation of suffering caused by epidemics, earth-quakes, famines, floods and other disasters, whether in India or abroad. It also coordinates activities related to Junior Red Cross, Health Education, Nursing Services and Blood Bank activities.

The Government of India has been assisting the Indian Red Cross Society in the form of grant-in-aid.

The St. John Ambulance Association, the Ambulance Wing of the Indian Red Cross Society, is also being helped by the government.

Prevention of Adulteration. The Prevention of Food Adulteration Act 1954 was first enacted in 1954, with the objective of supplying pure and wholesome food to the consumers and also to prevent fraud or deception. The Act came into force in the year 1955.

On the basis of experience gained from time to time, the Act was amended twice once in 1964, providing powers to Central Government to appoint its own food inspectors and Public Analysts for the enforcement of the PFA Act by Central Government for better and effective implementation where the States slacked due to various reasons, and again in 1976, with the objective of plugging the loopholes and making the punishments more stringent.

The Act is enforced by the State Government and Local Bodies in their respective jurisdiction. However, the State of Andhra Pradesh, Gujarat, Madhya Pradesh, Maharashtra, Sikkim, Tamil Nadu, Delhi, have taken up the responsibility of implementation of the Act at their level by establishing a separate Food & Drugs Administration/Directorate/or Wing.

Qualifications of Food Inspectors and Public Analysts have been laid down under PFA Rules 1955. In order to keep the knowledge of all functionaries at all times up-to-date, in-service training courses for Food Inspectors, Analysts and Senior Officers of the States are organised with the objective of achieving uniform implementation in food laws.

Drugs Control. The quality of drugs imported into, manufactured, sold and distributed in the country is regulated under the provisions of the Drugs & Cosmetics Act, 1940 as amended from time to time. The Central Drugs Standard Control Organisation is responsible along with the State Drug Control Organisation for enforcing the provisions of this Act and functions in the Directorate General of Health Services under the Drugs Controller (India).

Control over quality of imported drugs continued to be exercised by the offices of the organisation located at Bombay, Calcutta, Madras, Cochin and Delhi.

During the period April to October 1984 bulk drugs, drugs intermediates and chemicals and solvents, etc. required for the manufacture of drugs valued at Rs. 113.25 crore were imported into the country. 1298 samples of drugs are sent for test out of which 48 samples were found to be not of standard quality.

Under the provisions of the Drugs and Cosmetics Act and Rules, the Drugs Controller (India) is the approving authority in respect of New Drugs proposed to be imported or manufactured in the country and only such drugs which are considered safe and efficacious are permitted to be marketed.

The Central Drugs Laboratory, Calcutta is the statutory laboratory under the Drugs and Cosmetics Act for the testing of drugs.

At present this laboratory is acting as Government Analysts for 21 States/Union Territories.

During the period April to October, 1984, 2331 samples were tested by the Laboratory.

Medical Education. The Government of India launched the Reorientation of Medical Education Scheme in 1977 with the objective of involving the various medical colleges in the direct delivery of health care services to the rural and semi-urban population for purposes of re-orientation of medical education so as to afford a positive bias towards community services.

Under this scheme, each of the 106 medical colleges in the country shall accept, in the first instance, the total responsibility of promotive, preventive and curative health care of

at least three community development blocks in the district where the medical college is situated and, in a phased manner, cover the entire district in which the medical college is located.

Under the existing pattern, assistance for the implementation of the first phase of the Scheme is released at the rate of Rs. 4.79 lakh per medical college, for covering three community development blocks.

The Re-orientation of Medical Education Scheme is a 50:50 Centrally Sponsored Scheme and the responsibility for the implementation of the Scheme rests entirely with the concerned State Governments and Union Territories Administrations.

Regulatory Bodies. *The Medical Council of India* is a statutory body established under the Indian Medical Council Act, 1956. The main responsibility of this Council is the maintenance of standards of medical education in the country. For this purpose, the Council prescribed minimum standards of teacher-students ratio and other standard requirements in respect of equipment and the clinical facilities.

The Medical Council of India also awards the prestigious Dr. B. C. Roy National Award, the Hari Om Ashram Aembic Research Award etc. to eminent personalities in the field of medical education.

The National Board of Examinations was re-organised and established as an independent autonomous body by the Government of India with effect from 1-3-1982 duly registered under the Societies Registration Act.

The National Academy of Medical Science was established in 1961 in pursuance of a resolution passed by the Central Council of Health and Family Welfare. The Academy is a non-official organisation of scientists and is registered under the Societies Registration Act.

The Pharmacy Council of India (Central Council) was formed in 1949 under the Pharmacy Act, 1948.

The Council conducted 111 inspections during the year 1984. It approved and/or extended approval of Diploma Course in pharmacy in 113 Centres and degree course in 27 Centres. About 29 new centres for imparting Diploma Course in Pharmacy have

been started. The Council has so far approved 20 foreign qualifications to qualify for registration in India.

The Pasteur Institute of India, Coonoor, Nilgiris is engaged in conducting research in rabies, influenza, other respiratory virus infections, etc. and in the production of Anti-rabies Vaccine and DTP Vaccines.

Council of Research. The Indian Council of Medical Research (ICMR) as the apex body in the country to promote, co-ordinate and formulate bio-medical and health research, continued its various activities during the year on the lines and modified strategies devised in the early part of the 6th Plan period.

As in the past, the research programmes of the ICMR were implemented mainly through its permanent Research Institutes/Centres and also by means of extramural research through the Council's Centres of Advanced Research, national multicentre coordinated projects (mainly formulated by the Task Force approach) and through a large number of ad-hoc Research Projects and Research Fellowships at various Research Institutions/Medical Colleges/Universities in the country.

The Dental Council of India is a statutory body which was set up under the Dentists Act, 1948 with the prime objective of regulating the dental education, dental profession and dental ethics in the Country. For this purpose, the Council periodically carries out inspection of the dental institutions to ascertain the adequacy of courses and facilities available for the teaching of dentistry.

Indian Systems. "Indian Systems of Medicine" include all the non-allopathic systems of medicine and regimens excluding Homoeopathy, viz. Ayurveda, Siddha, Unani, Nature cure, Yoga and Amchi (Tibetan). In the Sixth Plan, Rs. 29 crore was provided in the Central Sector for development of Indian Systems of Medicine and Homoeopathy.

The National Health Policy as passed by Parliament assigns to the Indian Systems of Medicine and Homoeopathy an important role in the delivery of primary health care and envisages its integration in the overall health care delivery system, specially in the preventive and promotive aspects of health

care in the context of the national target of achieving "Health For All by 2000 AD."

A large number of practitioners of Indian Systems of Medicine and Homeopathy are practising in the rural and urban areas of the country. Generally speaking, the cost of medical treatment in these systems is less compared to that under the modern system (Allopathy).

The four Research Councils viz. (i) Central Council for Research in Ayurveda and Siddha (CCRAS); (ii) the Central Council for Research in Unani Medicine (CCRUM); (iii) Central Council for Research in Homeopathy (CCRH); and (iv) Central Council for Research in Yoga and Naturopathy (CCRYN); continued to initiate, aid, guide, develop and coordinate scientific research in different aspects—fundamental and applied—of the respective systems.

Planning a Family. India's planning process from its very start in 1951 recognised the inter-relationship between population and the socio-economic development; that is, long before the country became a signatory to the World Population Plan of Action in 1974. However, since 1974, much greater attention has been paid to the integration of population policies into the development process, which has been increasingly concerned with the amelioration of the lot of weaker sections of the community.

Quite early in the course of planning, it was recognised that State intervention was necessary for the establishment of a mutually beneficial relationship between population and development trends. The need has, ever since, been to contain population growth. After considerable experience in this regard, the country has set before itself the long-term demographic goal of achieving NRR (Net Reproduction Rate) of unity by 2000 A.D. with a birth rate of 21, death rate of 9 and infant mortality of less than 60. In order to achieve the goal, the National Family Welfare Programme has been, and will constantly be, strengthened.

It is a *voluntary programme* aimed at educating people on the benefits of the small family, rendering advice to couples about methods of contraception and providing a wide range of contraceptive supplies and services free of cost, leaving the choice of methods to individual couples.

Stabilised. India has recorded significant achievements in its population control programme. Ever since 1941–51, the decadal population growth rate had been constantly on the increase. From 13 per cent in that decade it rose to 25 per cent in 1961–71. For the first time it was stabilised at about the same level in the 1971–81 decade.

Thirty-seven million births were averted in the last decade as a result of family welfare measures. But, for these, the decadal growth rate would have been 30 per cent which would have further exacerbated our social and economic problems. It is important to note that the arresting of the growth was achieved despite a steep fall in the death rate from 27.4 per thousand in 1941–51 to 12.5 per thousand in 1981.

In terms of fertility decline, the programme has made a notable impact on the population since 1966. The crude birth rate has declined by about 8 points in 16 years, from 41.2 per thousand population in 1966 to 33.6 in 1982. During the years 1977 to 1980, the birth rate levels stagnated around 33 coinciding with the period of poor programme performance.

However, with the increasing momentum of the programme since 1980, there has been significant increase in the couple protection rate (CPR) during the last four years. The CPR which has fallen from 23.7 per cent in 1976–77 to 22.3 per cent in 1979–80, once again started showing an upward trend, thanks to fresh political commitment and vigorous implementation of the programme. The CPR increased to 22.7 per cent in 1980–81, to 23.7 per cent in 1981–82, to 25.9 per cent in 1982–83 and 29.4 per cent in 1983–84.

Long-term Goals. The long-term demographic goals of the country as spelled out in the National Health Policy, to attain a Net Reproduction Rate of one by the year 2000, are as below:

Birth rate: 21 per thousand. Death rate: 9 per thousand. Infant Mortality rate: Below 60 per thousand live births. Effective Couple Protection rate: 60 per cent. Life expectancy at birth: 64 years.

In order to realise these goals in the given time-frame, efforts to give further fillip to the acceptance of small family norm were inten-

sified. The programme gathered so much momentum as to yield a record level of 14.4 million acceptors during the year 1983-84. This represents a big leap forward over the level of 5.5 million acceptors during 1979-80.

Consistently improved performance during the last 5 years has been possible due, among other things, to a close monitoring of the Programme at the highest level.

Mother and Child. The Maternal and Child Health services refer to the broad and currently accepted meaning of promotive, preventive, curative and rehabilitative health care for mothers and children. Since mothers and children have additional needs for reproductive growth and development and are biologically more vulnerable to environmental influences, special programmes are required in pregnancy, child birth and childhood in addition to the general health measures.

During 1984-85 special emphasis was laid on the health status of mothers and children in the context of the 20-point Programme which stipulates acceleration of programmes of welfare for women and children and nutrition programme for pregnant women and nursing mothers and children. The National Health Policy has also attached great importance to the MCH Programme.

The infrastructure of delivery of maternal and child health services has been and is being expanded both in rural and urban areas by the setting up of primary health centres, rural family welfare centres and sub-centres, urban family welfare centres and post-partum centres.

Rural Health. In the National Health Policy strenuous efforts are being made to place people's health in the people's hands through a comprehensive primary health care system reaching out to the population even in the remotest areas, with the maximum community participation.

This system is being harnessed as an instrument of promoting both family planning and health care.

The main programme/schemes being implemented under the Minimum Needs Programme, to provide primary health care relevant to the actual needs of the community in the rural areas are indicated below:

Sub-centres are being established on the basis of one sub-centre for every 5000 population in general and for every 3000 population in hilly, tribal and backward areas. The additional sub-centres to be established during the 6th Plan period will raise their number to about 80,000 against the estimated total requirements of 1,30,800.

127. REACHING OUT TO SPACE

India's space programme has come of age. With the launching of her own satellites in her own vehicles and deploying her own communication satellites to geostationary orbit, India has earned a coveted place in the exclusive space club. Indians are joining the selected band of space-travellers also.

The Indian Space programme is directed towards harnessing space technology in a self-reliant manner for: (1) Satellite communications including direct TV broadcasting to community receivers (2) Natural resources survey & management including environmental monitoring and meteorological forecasting. To achieve these ends, India is actively involved in developing and operationalising a series of satellite and launch vehicle systems.

Organisation. The Indian Space programme began with the setting up of a

sounding rocket launching facility at Thumba, a fishing hamlet near Trivandrum in 1963. The Thumba Equatorial Rocket Launching Station (TERLS), which in 1968 was dedicated to the United Nations Organisation, served as the nucleus for the growth of Indian Space Research Organisation (ISRO), which today encompasses the following Centres

- (1) Vikram Sarabhai Space Centre (VSSC), Trivandrum;
- (2) SHAR Centre, Srihankota;
- (3) ISRO Satellite Centre (ISAC), Bangalore;
- (4) Auxiliary Propulsion System Unit (APSU)

Bangalore; (5) Space Applications Centre (SAC), Ahmedabad; (6) Development & Educational Communication Unit (DECU), Ahmedabad; and (7) ISRO Telemetry, Tracking & Command Network (ISTRAC) with its headquarters at Bangalore.

The Department of Space (DOS) located at Bangalore is responsible for the execution of

Bracing up for Shuttle

The two Indian astronaut probables, Mr. N. C. Bhat and Mr. P. Radhakrishnan, being trained in Bangalore will move to Houston in the United States in May 1986 for flight-related training.

One of them will be selected to fly aboard a US space shuttle late this year.

The Indian astronaut on board the space shuttle will deploy INSAT-1C and operate special cameras for photographing the Indian subcontinent to assess its natural resources. He will also perform Yoga exercises.

Mr. Radhakrishnan, 42, was worried about his age. He felt it could work against him. However, he was selected for the training because of his fitness. He has been a yoga exponent for the past five years.

Mr. Radhakrishnan headed the Test and Evaluation Division at the Vikram Sarabhai Space Centre, Trivandrum, before he was selected. He said the tests at Houston were nothing compared to the rigorous tests he had undergone within the country.

The two astronaut trainees will experience aerobatics in a Kiran trainer at the Aircraft Systems and Testing Establishment at Bangalore to gain experience in weightlessness and high gravitational forces.

Mr. Bhat, a Master of Engineering from the Indian Institute of Science, Bangalore joined the ISRO in 1973 and was the programme Manager for the Stretched Rohini Satellite Series.

The final selection would be made in August.

(UNI: December 23, 1985)

India's Space activities through ISRO. The Physical Research Laboratory (PRL) at Ahmedabad, an institution supported mainly by DOS, conducts research in space and related sciences. The DOS-supported National Remote Sensing Agency (NRSA) at Hyderabad, is engaged in using remote sensing techniques for the survey and management of natural resources.

Own Spacecraft. The Indian Space Programme took a major forward step with the launching of the first indigenously built spacecraft, Aryabhata, in 1975. This 360-kg satellite, designed to acquire the basic expertise in satellite technology, was placed into orbit from the Soviet Union by a Soviet rocket carrier.

Aryabhata was followed by *Bhaskara-1*, an experimental earth observation satellite. Launched in 1979, Bhaskara-1 carried TV camera and microwave radiometer payloads for Earth observation studies in hydrology, forestry, snow melting and oceanography. An improved version of this satellite, Bhaskara-II, was launched in 1981. The Bhaskara Satellites were also launched by Soviet rocket carriers.

In the area of satellite communication, ISRO conducted two largescale experiments relevant to India's communication needs. They were: (a) Satellite Instructional Television Experiment Project (SITE) during 1977-79 Under SITE, developmental programmes were telecast direct to community receivers in 2,400 villages, using the American satellite, ATS-6. Similarly, with the aid of the Franco-German 'Symphonie' spacecraft, a series of innovative communication experiments were conducted under STEP.

Launch Vehicle. Parallel to spacecraft technology, India took steps for building its own first satellite launch vehicle, SLV-3. The fourstage, solid propellant SLV-3, during its three successful flights in 1980, 1981 and 1983, orbited Indian-built Rohini series satellites.

In June 1981, India's first experimental geostationary communications satellite, AP-6LE, was successfully launched aboard the European Space Agency's Ariane launch vehicle from Kourou in French Guyana. During this satellite's active in-orbit life of 27 months, it was used to conduct a variety of

Milestones In Indian Space Programme.

1962: Indian National Committee for Space Research (INCOSPAR) formed by the Department of Atomic Energy, Government of India to aid and advise in starting the space programme.

1963: Thumba Equatorial Rocket Launching Station (TERLS) established in response to the longfelt need of scientists to make in-situ measurements of upper atmospheric parameters, particularly of equatorial electrojet.

1965: The Space Science & Technology Centre (SSTC) established in Thumba as a research and development laboratory in space technology for achieving self-reliance in this field.

1967: An earth station for satellite telecommunication set up at Ahmedabad to provide facilities for training and research in this technology. Engineers trained here help set up the first Indian commercial satellite telecommunication earth station at Arvi, near Ponna.

1968: TERLS dedicated to the United Nations.

1972-1976: A number of air-borne remote sensing experiments conducted for surveying earth resources.

1975: The first Indian Satellite, Aryabhata, launched on April 19, 1975 from the Soviet Union.

1975-1976: The first major space application programme. Satellite Instructional Television Experiments (SITE), conducted during August 1975, July 1976

using the American Satellite, ATS-6.

1977: The Satellite Telecommunication Experiments Project (STEP) carried out from the middle of 1977 to 1979 using the Franco-German satellite, *Symphonie*.

1979: The Second Indian Satellite, a satellite for Earth observations, *Bhaskara*, launched on 7th June 1979 from the Soviet Union.

1980: SLV-3, India's first Satellite Launch Vehicle, puts Rohini Satellite into a near-earth elliptical orbit from Sriharikota on 18th July, 1980.

1981: India's first experimental geostationary communication satellite, APPLE, successfully launched by ESA's Ariane Launch Vehicle from Kourou, French Guyana, on 19th June 1981. India's second satellite for Earth observation, *Bhaskara-II*, launched from the Soviet Union on 20th November, 1981.

1983: Second developmental flight of SLV-3 successfully conducted from Sriharikota on 17th April 1983 and RS-D-2 satellite orbited. INSAT-1B India's multi-purpose domestic satellite, launched on board USA's Space shuttle, 'Challenger' on 30th August 1983.

1984: The first joint Indo-Soviet manned mission launched on 3rd April, 1984. Sqn. Ldr Rakesh Sharma became the first Indian cosmonaut.

1985: Two Indians selected for Indo-US joint Shuttle flight.

advanced satellite communication experiments. It also provided live TV coverage of selected national events.

The successful launching of INSAT-1B, a multi-purpose domestic satellite, on board the American Space Shuttle in 1983, and its operationalisation has given India the capability of country-wide domestic telecommunications, meteorology and direct community TV broadcasting.

Larger Vehicle. The SLV-3 project provided India with the expertise for embarking on the development of larger and

more sophisticated launch vehicles. Currently, an Augmented Satellite Launch Vehicle (ASLV) designed to orbit 150-kg satellites and a Polar Satellite Launch Vehicle (PSLV) capable of injecting 1000-kg class satellites into a polar sun-synchronous orbit are under development.

To meet the payload requirements of ASLV, expected to be ready in 1985, ISRO is now developing a series of 150-kg spacecraft called Stretched Rohini Satellite Series (SROSS) covering selected missions in the areas of scientific research, technology and remote sensing.

Another important project on hand is the Indian Remote Sensing Satellite (IRS) series. The first such satellite is scheduled to go into orbit in 1986 launched from the Soviet Union. The three-axis stabilised 850-kg IRS will carry payload to collect data on agriculture, forestry, hydrology, snow-melting and meteorology.

Sounding Rockets. ISRO had developed and qualified a series of Sounding Rockets like RH-125, RH-200, Centure, RH-300, RH-560, etc., for meteorological and upper atmospheric research. RH-560 is India's largest Sounding Rocket capable of reaching an altitude of 350 km with a 100-kg payload weight. Flights are regularly conducted from India's three sounding rocket ranges at Thumba, Srihankota and Balasore.

India attaches great importance to co-operation with other countries and international agencies, most prominent among them being the USSR, the USA, The Federal Republic of Germany (FRG), France, the European Space Agency (ESA), the United Kingdom (UK) and the United Nations.

Indo-Soviet collaboration in Space began with the USSR extending technical assistance to India in setting up her Thumba Equatorial Rocket Launching Station (TERLS), way back in 1962. TERLS was dedicated to the United Nations in 1968 and has since operated as an international sounding rocket range.

Regular meteorological soundings are being jointly conducted from TERLS by India and the USSR using the Soviet M-100 rockets. The collaboration between the two countries further intensified with the USSR offering free launches for the three Indian satellites,

Aryabhata, Bhaskara-I and Bhaskara-II.

USSR Help. The USSR also helped India establish her Satellite Tracking & Ranging Station (STARS) and offered the Luna-24 moon rock samples to Indian scientists for investigation. Scientists from the two countries have also conducted joint balloon experiments in gamma-ray astronomy from India's balloon facility at Hyderabad.

With the successful completion of the eight-day Indo-Soviet joint manned mission abroad Soyuz-T-11/Salyut-7, the collaboration between the two nations in the peaceful use of outer space, which entered its twenty-second year in 1984, literally came of age.

The launch of the first Indian Remote Sensing Satellite (IRS), scheduled to take place during 1986, would again be from the USSR on board the first launch vehicle commercially procured from that country.

The dedication of TERLS to the UN; the conduct of instructional television experiments via USA's ATS-6 satellite and communication experiments using the Franco-German 'Symphonie' spacecraft; the launching of Aryabhata and Bhaskara spacecraft by the Soviet Union and of APPLE on board ESA's Ariane; and the orbiting of INSAT-1B USA's Space Shuttle are important landmarks in India's policy of active collaboration with other countries in harnessing Space for national development.

As part of ISRO's co-operation with industry, many technologies/processes developed by ISRO in the areas of electronics, chemicals and materials have been transferred to Indian industries for commercial production.

128. TOURISM—LARGEST EARNER

Tourism is the largest foreign exchange earner for India, the earning going up from 1130 crore in 1982-83 to Rs.1250 crore the next year. The entire earning during the 6th plan has been around Rs.5000 crore, while the earning from all exports during the same period was Rs.50,000 crore. However, India's share in the world tourist market is only a bare 0.3 per cent.

Tourism attracted 10 per cent of India's foreign exchange earning without exporting any resources. Unfortunately, the Sixth Plan provided only Rs.187.46 crore or roughly 0.18

per cent of the entire allocation for tourism development.

Tourism planners feel that if only tourism were given the right environment to grow, it

could fulfil the target of 2.5 million tourists by 1990. It can earn around Rs.15,000 crore in foreign exchange also in the Seventh Plan.

The Department of Tourism is responsible for the promotion of India abroad as a Holiday and Tourism destination, and development of tourism infrastructure and facilities in the country. It also performs regulatory functions in the field of tourism.

The Department carries out publicity and promotion campaigns through its 18 tourist offices and 8 tourist promotion offices overseas located in the major tourist generating markets of the world viz. U.S.A., Canada, U.K., Western Europe, Australia, South East Asia, Japan, and West Asia and also in India.

Tourist Arrival. Foreign tourist traffic to India registered a growth of about 10.4 percent during the first half of 1984 as compared to the same period of the previous year. However, it suffered a serious setback in the latter half of the year with tourist arrivals declining every month from July onwards. The decline was mainly due to a series of internal disturbances, political problems in some of the neighbouring countries and introduction of visa restrictions on foreign tourists of all nationalities.

The actual arrivals (excluding those from Pakistan and Bangladesh) during the year 1984 was 852,503 as compared to 884,731 tourists in 1983. Thus, the decline in tourist arrivals during the year 1984 as compared to the previous year was 3.6 percent.

The tourist arrivals from Pakistan and Bangladesh during 1984 was 355,636 (Provisional) as compared to 420,245 tourists during 1983. The total tourist arrivals including nationals of Pakistan and Bangladesh was, therefore, 1,208,139 (Provisional) during 1984, registering a decline of 7.4 percent over 1983.

As per the information available from the Reserve Bank of India, the foreign exchange earnings from tourism during 1982-83 was Rs.1130.6 crore against Rs.1063.9 crore during 1981-82, registering a growth of about 6.3 percent.

An exploratory study is now being undertaken on two selected travel circuits (one each in Kerala and Madhya Pradesh) to assess the potentials of the travel circuit concept, to develop the criteria for prioritising the travel circuits and the centres falling

Domestic Tourism

A major shift in the priorities of the Tourism Ministry in the Seventh Plan is envisaged according to Mr. H.K.L. Bhagat, Minister of Tourism. The Minister said a luxury hotel under construction will complete the ITDC chain in Bombay in the 6th Plan period.

The emphasis on domestic tourism had arisen from the awareness of the size of the potential market. "Guesstimates" put the number of annual travellers in India at 400 million. While most of the travel was for work or business, the goal of his Ministry was to motivate these travellers to visit places of cultural interest or take time off for leisure and entertainment.

Using a variety of promotional measures as well as developing an adequate infrastructure, the Seventh Plan approach would be to "make tourism a movement", Mr. Bhagat added.

Among the plans for infrastructural improvement, he cited the provision of 90 per cent grants-in-aid to the Bharatiya Yatri Avas Vikas Samiti for setting up 25-30 'yatrikas' in the Seventh Plan period. These "dharmashala" type facilities would be available for as little as Rs. 1 or Rs. 2 a day. While Rs. 40 lakh would be spent in the current year on this head, Rs.2.5 crore had been earmarked for the entire Plan period.

on them, and to evolve a suitable monitoring system.

Regional Offices. Within India the Tourist Offices supply information regarding tourist centres and facilities available at these places. These offices maintain liaison with State Governments and also help the Department in exercising control over different segments of the travel trade to ensure that services to tourists are maintained efficiently and are available at reasonable rates.

There are four Regional Offices located in Delhi, Bombay, Calcutta and Madras. These offices supervise the working of other Tourist Offices at Goa, Khajuraho, Lucknow, Jaipur,

Varanasi, Agra, Patna, Bhubaneswar, Bangalore, Hyderabad, Cochin and Port Blair. There is also a sub-regional Tourist Office in the North Eastern Region at Guwahati which supervises the working of Tourist Offices at Shillong, Imphal and Itanagar.

In addition to the above, there is the Gulmarg Winter Sports Project Office in Srinagar, and the Indian Institute of Skiing and Mountaineering in Gulmarg.

Overseas: Highly competitive market situation continues to prevail amongst the many countries of the world who wish to attract affluent tourists from the developed world. In this situation the existence/opening of the overseas Tourist Offices of the Department of Tourism has acquired considerable importance.

With the object of achieving optimum impact, the Department of Tourism and Air-India under the "Operations" Scheme are engaged in joint promotional efforts in Europe, U.K., America, East Asia, West Asia and Australasia through 18 full-fledged offices and 8 one-man offices. The Tourist Office at Kuala Lumpur started functioning from December, 1984.

The 18 overseas Offices: New York, Los Angeles, Chicago, Toronto, London, Geneva, Paris, Frankfurt, Brussels, Stockholm, Vienna, Milan, Sydney, Singapore, Kuala Lumpur, Tokyo, Bangkok and Kuwait.

In addition, there are eight one-man offices at San Francisco, Miami, Osaka, Melbourne, Dubai, Kathmandu, Washington and Dallas.

Industry Status. The National Development Council in their meeting held in July, 1984 recommended that Tourism should be accorded the status of an Industry. Accordingly, the Ministry of Tourism & Civil Aviation requested the State Governments to take necessary action on this decision of National Development Council to declare Tourism as an Industry.

The State Governments were also requested to ensure that concerned Departments in their States e.g. Finance, Industry and Local bodies extend the same concessions to Tourism related activities which are being accorded to activities that have formally been declared as an "Industry" in their States. The Financial Institutions like IDBI, ICICI, IFCI, etc. have also been approached

to treat hotels and other tourism related activities favourably for purposes of concessional credit.

The Department had an approved outlay of Rs.25 crore in the Sixth Five-Year Plan (1980-85).

In the Annual Plan 1984-85, the emphasis continued to be for the building up of the tourism infrastructure in the country. To optimise the use of limited resources available for this purpose the Department adopted the concept of identifying the travel circuits in the Sixth Plan for the development of identified tourist centres in an integrated and a phased manner by pooling the available resources in the Central, State and Private Sectors.

In the first phase 40 schemes/projects have been identified in various States/Union Territories of which 12 were taken up during 1984-85 and rest would be taken up for implementation in the Seventh Plan.

The Seventh Plan. The Seventh Plan strategy will be to diversify foreign tourism to the Southern and Eastern parts of the country, development of infrastructural facilities in centres on the identified travel circuits and introduction of Water/Winter Sports. In addition, the Department will continue to improve India's cultural attractions because of the unique attractions and potential of drawing large number of tourists from all over the world, preparation of master and environmental development plans and integrated development projects.

Efforts to promote domestic tourism and facilities for budget tourists from abroad will continue by initiating a major programme of expansion of *youth hostels* throughout the country. Similarly, emphasis will be given for promotion of trekking tours in Himalayan States and special interest tours to the National Parks and Wild Life Sanctuaries.

In Publicity and Promotion, emphasis will be given to overseas marketing research, identification of special interest tourism and promotion of inter-regional tourism covering countries of Asia and the Pacific region. Emphasis will also be given to training and professionalisation of manpower at various levels for the hotel and catering industry.

Hotel Accommodation. The Department of Tourism approves hotels from

the point of their suitability for foreign tourists. By the end of 1984, there were 470 hotels with 32,692 rooms on the approved list of the Department of Tourism. Besides, 14,936 additional rooms would be added when 253 new hotel projects approved by the Department during 1984 are completed.

Hotels are also classified under the star system on the basis of standard of services and the facilities provided by them. During the year 1984, seven new hotels were classified bringing the total to 321 in the country with 21,353 rooms. The approved hotels are entitled to fiscal benefits, facility of import, overseas publicity and promotion and training abroad under the 10% Incentive Quota based on their foreign exchange earnings. During 1984, 103 hotels availed themselves of the incentive quota facility on the basis of foreign exchange earned by them during 1983-84. The foreign exchange was released to five candidates for proceeding abroad for further studies in Hotel Management and Culinary course.

For the tariff year October to September, all approved hotels were required to get their tariffs approved so that it is commensurate with the services and facilities provided by them.

The interest subsidy of Rs.6.36 lakh was released in the year 1984 (which also includes the first quarter of 1984) to the Industrial Finance Corporation of India on account of loans given by them to the new hoteliers at 1% below their normal rate of interest.

Youth Hostels. Construction work on 10 Youth Hostels as part of continuing schemes at Patna, Shillong, Imphal, Itanagar, Aizwal, Guwahati, Namchi, Dimapur, Agartala and Agra has been accelerated and is at various stages of implementation.

While the completion of these projects there would be 28 Youth Hostels built by the Department of Tourism all over the country. There is almost every State and Union Territory which will have at least one Youth Hostel on completion of these projects. During the 7th Five-Year Plan, it is proposed to expand the network of Youth Hostels by taking up 60 more Youth Hostels.

Priority will be given keeping in view the potential of a place for promoting youth travel. The proposed facility would give a

fillip to youth travel both within India and from overseas. The Department keeps a close coordination with Youth Hostel Association of India which is an affiliate to the International Youth Hostels Association. This item of work, however stands transferred to the new Ministry of Sports & Youth Affairs, with effect from 4th January, 1985.

Under Wild-Life Tourism facilities are provided at Wild Life Sanctuaries in the form of Forest Lodges, transport facilities, development of Safari Parks, etc. Under the continuing scheme, Forest Lodges at Betla, Simlipal, Kuba Huts at Wild Ass Sanctuary (Gujarat) have been taken up as also provision of transport facilities at important National Parks.

The Tourist Village Complex at Shivpuri in Madhya Pradesh is a novel idea. It aims at providing basic facilities to over-land tourists in rural settings. It would also provide an opportunity to the local artisans to improve their traditional arts and crafts and would offer them a market for some of their products and a chance to the tourists to purchase souvenirs/mementos from the craftsman. It is a project of Rs.34.04 lakh and is being funded by the Department of Tourism. The complex is likely to be commissioned during 1985-86.

Training Programmes. The programme of training manpower for the hotel and catering industry with a view to professionalise the work force was first taken up during the 3rd Five-Year Plan and four Institutes of Hotel Management, Catering Technology & Applied Nutrition were established at Bombay, Delhi, Calcutta and Madras. Up to the end of the 6th Plan, it was proposed to increase the number of Institutes to 25, 11 of which would offer facilities for training the middle management and supervisory as well as craftsman level staff for the hotel and catering industry.

The remaining fourteen Institutes were planned to impart training only at the craft level to meet the manpower needs at the skilled workman level in the hotel industry. It is anticipated that the target of establishing 25 Institutes would be achieved by the end of the 6th Plan period. So far 11 Diploma level and 12 craft level Institutes have been established in different parts of the country.

As against 1150 students under training in the Management courses and 1100 in other

craft and housewives courses in the Diploma awarding Institutes last year, in the current academic session about 1703 candidates are undergoing training in the Management course and 1763 in other craft and housewives courses in the Institutes of Hotel Management, Catering Technology & Applied Nutrition at New Delhi, Bombay, Madras, Calcutta, Srinagar, Ahmedabad, Hyderabad, Bhubaneswar, Bangalore, Lucknow and Goa. As regards the Foodcraft Institutes there were about 740 students undergoing training in 1984-85.

The Indian Institute of Tourism & Travel Management was set up in 1983 as a registered Society. The governing body of the Institute is chaired by the Minister of Tourism & Civil Aviation which also has representatives from the tourism and travel industry and management institutes.

In the first phase, the Institute is offering in-service Executive Development Programmes (EDPs). The Institute is preparing for a two-year post-graduate course on Tourism and Travel Management. This programme will be designed for graduates and will include basic information about travel and tourism, knowledge about India, general management in various functional areas and management techniques.

National Council for Hotel Management and Catering Technology is an autonomous organisation set up by the Department of Tourism, Government of India in 1984. Minister for Tourism and Civil Aviation is the President of the Council.

National Council is mainly concerned with the coordinated growth and development of Institutes of Hotel Management and Catering Technology and Foodcraft Institutes all over the country. It will act as an apex organisation by affiliating the existing Institutes of Hotel Management and Catering Technology and other Institutes engaged in similar activities; conduct examinations; prescribe common syllabi, conduct research studies in the field of hotel and restaurant industry and award certificates, diplomas, academic distinctions, etc. The Council is fully financed by Grants-in-aid from the Central Government under the approved pattern of Finance.

Tourism Corporation. Established on October 1, 1966 Indian Tourism Development Corporation (ITDC) has been in opera-

tion for 18 years. It has been one of the prime movers in the progressive development and expansion of India's touristic infrastructure.

With a view to further expanding business potentials of Duty Free Shops, increasing its existing span of operations by utilising existing commercial space in ITDC Hotels and entering into trading operations of selective and exclusive nature, a new Division called International Product Sales has been created in the Corporate Office. With the amalgamation of Co-ordination Division with Personnel Division, the Divisional set-up now comprises eleven Divisions viz. Hotels, Marketing, Ashok Travels & Tours, Finance & Accounts, Management Services, Coordination & Personnel, Materials Management & Development, Vigilance, Projects, International Product Sales and Production & Publicity.

There are five Regional Offices at New Delhi, Bombay, Madras, Calcutta and Bhopal. There are no overseas offices. However, for the overseas consultancy projects at Mosul and Dikan in Iraq, the requisite engineering and administrative staff has been posted at these places.

The ITDC chain now consists of the Ashok Group of Hotels (24 hotels including 2 beach resorts), 4 Forest Lodges, 9 Travellers Lodges, 7 Restaurants including 3 Airport Restaurants, 18 Ashok Travels and Tours Units, 1 Tourist Service Station, 10 Duty Free Shops and 3 Sound and Light Shows. The Corporation is also handling catering services at Western Court, Ashok Mayur Restaurant at Vigyan Bhavan and the State Guest House and Hospitality Centre at Hyderabad House at New Delhi besides providing managerial services to the State-owned Hotel Pinewood Ashok at Shillong, and marketing services to private sector Hotel Claxby at Agra.

The financial performance of the Corporation upto 30-11-1984 in the financial year 1983-84 as compared to the corresponding period in 1982-83 is as under:

(Rs. in lakhs)

	April '84 to Nov. '84	April '83 to Nov. '83
Turnover	3343.22	2889.76
Operating profit	620.87	466.74
Net profit/loss	(-) 130.08	(-) 332.17

The turnover has increased by 15.7% due to which the Corporation could reduce its losses from Rs.332.17 lakh last year upto the same period to Rs.130.08 lakh.

Although the turnover of accommodation and catering units improved from Rs.3568.47 lakh in the previous year to Rs.3802.95 lakh representing an increase of 6.6%, there was a net loss of Rs.97.57 lakh in 1983-84 as against a profit of Rs.114.40 lakh in the previous year. This was mainly due to heavy burden of depreciation, interest on loans, increased wage bill, surplus hotel accommodation and stiff competition in the hotel industry.

The performance of Hotel Janpath and Kanishka, New Delhi, Laxmi Vilas Palace, Udaipur, Airport Ashok and Varanasi Ashok was encouraging. The Kovalam Ashok Beach Resort came out of the red for the first time and earned a net profit of Rs.1.35 lakh as against a loss of Rs.10.34 lakh in 1982-83.

Award Winners. List of Travel Agents/Tour Operators who have been ad-

judged for giving awards for their foreign exchange earnings during 1984.

Category-1 (Foreign exchange earning above Rs.5 crore): 1. Travel Corporation (I) Pvt. Ltd., Bombay; 2. Sita World Travel Pvt. Ltd., New Delhi; 3. Mercury Travels (I) Pvt. Ltd. New Delhi.

Category-2 (Foreign exchange earnings above Rs.1 crore and upto Rs. 5 crore): 1. Cox & Kings (I) Ltd., Bombay; 2. Travel India Bureau Pvt. Ltd., New Delhi; 3. Indtravels, Bombay.

Category-3 (Foreign exchange earnings above Rs.50 lakh and upto Rs. 1 crore): 1. United Travel Services (International) Pvt. Ltd., New Delhi; 2. Holiday Maker (I), New Delhi; 3. Eastman Travel & Tour (P) Ltd., Bombay.

Category-4 (Foreign exchange earnings above Rs. 25 lakh and upto Rs. 50 lakh): 1. Business & Tourist Service, New Delhi; 2. Perfect Travel & Tours Pvt. Ltd., New Delhi; 3. Paradise Travel Tour Co. (I) Pvt. Ltd., New Delhi.

129. ENVIRONMENT: GANGA PLAN

India has embarked on a multicrore scheme of cleaning up her mightiest river, the Ganga from pollution from almost 100 cities spread out in the states of Uttar Pradesh, Bihar and Bengal. Of all the environmental protection measures India has taken, the Ganga Project is the largest and the boldest.

The idea is to clean up the Ganga and develop it into a 'national waterway'. The 292-crore project began in right earnest by cleaning work at Hardwar and Rishikesh, the two well-known pilgrim centres, in September 1985. The work is being carried out by the engineers of the Uttar Pradesh Jal Nigam under a project costing Rs. 1 crore.

The cleaning work at Varanasi waterfront, one of the most polluted stretches of the river, has also been going on for some time.

The 292-crore project got final clearing at the first meeting of the Central Ganga Authority, presided over by Prime Minister Rajiv Gandhi. The authority, however, decided that expenditure on the scheme during the Seventh Plan would be limited to Rs. 240 crore.

Source of Pollution. The cleaning of the Ganga has attracted national and international attention because of the magnitude of the project. About 100 cities on the river bank have been identified as the major source of pollution. Of this, 29 are class-1 cities with populations of over one hundred thousand, each accounts for 90% of pollution.

The first phase of the action has been provided for treatment of their sewage before discharge into the river. Action also is planned to control the discharge of industrial effluents, which are the major source of pollution besides sewage. A survey in Dec. 1984 identified 4159 large and medium units responsible for causing pollution. Of this, 1966 have so far set up treatment plants and action is being taken against more than 100 defaulters.

Kitchens & Cars Pollute.

Pollution due to automobile emissions and domestic firewood consumption poses a greater danger than that caused by industries, according to a five-year study on air pollution in Bangalore city.

The study initiated by the ICMR Regional Occupational Health Centre in Bangalore found that industries in general did not seem to pollute the city air primarily because they were located on the periphery.

Poor road maintenance and exhaust emissions, besides increasing firewood consumption, were contributing to higher levels of lead, suspended particulate matter (SPM), sulphur dioxide, oxides of nitrogen and total oxidants and sulphides in the air, Dr. H. R. Rajmohan, of the Centre revealed.

While there was no immediate threat due to air pollution, the problem would assume alarming proportions if the number of vehicles on the road increased at the present rate, he added.

For the study, 20 air sampling stations were established in the city after dividing it into three zones— industrial, commercial and residential. Air samples were collected from these stations for eight hours during the first year of the study, for 12 hours during the second year and for 24 hours subsequently.

A preliminary survey showed that all the major industries, mainly metal-based engineering units, were situated at the city's periphery, away from thickly populated pockets. It was also revealed that there were few thickly populated areas in the city environment, where the pollution levels were considerable.

It was observed that there was a higher pollution level in the commercial zone than in the residential zone.

(PTI: September 29, 1985)

De-polluting the Ganga will have a positive effect on the health of the inhabitants living along its ports, who are now endangered by the bacteria discharged along

with sewage and toxic effluents. Cleaning up the river will increase its yield of fish.

No less important will be the improvement of environment. People who have been away because of pollution will be back to its banks for recreation. All these are sufficient justifications for the investment; particularly experts now estimate that the sale of energy (electricity and gas) and organic manure provided from the sewage and effluents treatment plants may cover their running costs.

First Phase. The first phase of the giant project is expected to save the Ganga from 27 cities' dirt.

The Ganga is receiving the polluted waters of domestic sewage and industrial effluents from such locations—26 in Uttar Pradesh, 15 in Bihar, 59 in West Bengal.

Dr. Nilay Chaudhury, Chairman Central Pollution Control Board, feels that if these 27 cities were prevented from polluting the Ganga, 84 per cent of the total pollution would be controlled.

Only 10 out of 27 cities had sewerage systems covering a fraction of total population. In Patna and South Dum Dum (West Bengal), 25 per cent of population were covered by sewerage systems. The immediate task was to arrange diversion of sewerage and create treatment facilities at the locations.

Sewage Diversion. Places like Kanpur, Allahabad, Varanasi and Patna besides Bhatpara, South Dum Dum, Jadavpur and south suburban in West Bengal should require more than one location where sewage would be diverted. Therefore, the plan conceived of 54 locations where sewage would be diverted for treatment and subsequent conversion into resources.

In each of 54 locations, research recycling units are proposed to be built to treat sewage and generate energy and produce manure, among others, through various processes.

An entrepreneur running a unit would earn an annual profit of Rs. 11 lakh if it served a population of one lakh. He also pleaded for developing a cadre of entrepreneurs to run the units with profit.

The Ganga Project Directorate was the custodian for the total implementation of the

projects while the State Pollution Boards would oversee the work of the agencies to clean the Ganga.

Dutch Help. Dutch participation in the cleaning project also has been ensured. The Netherlands will be actively involved in the projects for navigability between Allahabad and Patna. This work will begin simultaneously with the work downstream.

The Dutch have long experience in water management and dredging, as the entire life of the country is bound up with management of the Rhine and protecting the coasts from sea erosion.

The Dutch Transport Minister, Mrs. Neelie Smit-Kores, on a visit to New Delhi in December 1985 said that the Dutch called the water "both a friend and an enemy; fight the enemy and make it a friend". The Rhine was called Father Rhine in Western Europe

and since the Ganga was called the mother, it would perhaps, be right to have a marriage between the two, she said.

Management of the Rhine began, with attempts to make it navigable, in the 11th and 12th centuries, and progressed to ecological management only in the recent past. However, in India a comprehensive attempt was planned to clean, dredge and make the Ganga navigable at the same time. This was a tremendous task, and the Netherlands was willing and able to offer all assistance, she said.

The Dutch had undertaken major dredging, land reclamation and water management works and had a corporation of consultants whose expertise could be drawn upon. The monetary component of the first phase, for consultancy and of equipment, would be to the tune of 15 million Dutch guilders.

130. STATES AND TERRITORIES

The Union of India, made up of 22 States and 9 Union Territories, is in a state of demographic transition. Demographic transition indicates the passage of a population from high mortality and fertility rates to low mortality and low fertility.

The 1981 Census count placed the Indian population at 685.2 million as on the first of March. The population has grown at an annual average rate of 0.83 per cent* between 1901 and 1951 and at a more rapid pace of 2.13 per cent in the post-independence period between 1951 and 1981. If this rate continues until the year 2000, the Indian population would be 1025 million, about one-half more than what it is today.

There are many stages in the demographic transition beginning with a declining mortality and continuing fertility to a stage where both mortality and fertility rates decline more or less at the same rate and keep the population stable over a period of time.

The difference is essentially a difference of ratios between mortality and fertility rates in population group. The Indian nation is not a population group in this sense. Rather, it is made up of various population groups. These population groups tend to be so small that

even a State may contain a large number of such groups.

Major States. But at present, the States remain the lowest population group which can be demographically assessed. On this basis, the 15 major States (excluding Assam, where the census has not been completed) may be grouped into four: (i) Jammu & Kashmir, Rajasthan, Uttar Pradesh and Bihar, (ii) Karnataka, Punjab and Andhra Pradesh, (iii) Haryana, Gujarat, Madhya Pradesh, Maharashtra and West Bengal and (iv) Kerala, Orissa and Tamil Nadu.

These 15 states contain 94.2 per cent of India's population. Only three states among them (Kerala, Orissa & Tamil Nadu) with a total population of 100 million or 15.5 per cent, are in an advanced stage of transition with a declining growth rate below 2 per cent. The growth rates of another five states (group iii) with a total population of 216 million or 33.6 per cent have started declining, though still above 2 per cent. The

* Percentage based on the provisional figure of 684 months.



remaining seven states (groups i & ii) with slightly above half the population (50.9 per cent), are just entering the demographic transition with declining mortality but with no significant decline in fertility.

Growth Rates. The growth rate for 1971-1981 averages at around 2.48 per annum for all India. As against this, the growth rate

for group (i) is above 2.5 and for group (ii) around 2.5, both increasing trends. For group (iii) the growth rate averages below 2.5. Though this is still an increasing growth rate, it is on the low side. Group (iv) shows an average of less than 2, definitely a declining trend.

It may, therefore, be said that group (i) is in the earliest stage of transition with a declin-

Union of India: Basic Data

Region	Capital	Area (Sq. Km.)	Population (1981)	
INDIA	New Delhi	3,287,263@	685,184,692	
States:	Capital:	Area (sq. km.)	Population (1981)	Percent- age to All India†
1 Andhra Pradesh	Hyderabad	275,068	53,549,673	7.82
2 Assam‡	Dispur	78,438	19,896,843	2.90
3 Bihar	Patna	173,877	69,914,734	10.20
4 Gujarat	Gandhinagar	196,024	34,085,799	4.97
5 Haryana	Chandigarh	44,212	12,922,618	1.89
6 Himachal Pradesh	Simla	55,673	4,280,818	0.62
7 Jammu & Kashmir	Srinagar/Jammu*	222,236	5,987,389	0.87
8 Karnataka	Bangalore	191,791	37,135,714	5.42
9 Kerala	Trivandrum	38,863	25,453,680	3.71
10 Madhya Pradesh	Bhopal	443,446	52,178,844	7.62
11 Maharashtra	Bombay	307,690	62,784,171	9.16
12 Manipur	Imphal	22,327	1,420,953	0.21
13 Meghalaya	Shillong	22,429	1,335,819	0.19
14 Nagaland	Kohima	16,579	774,930	0.11
15 Orissa	Bhubaneswar	155,707	26,370,271	3.85
16 Punjab	Chandigarh	50,362	16,788,915	2.45
17 Rajasthan	Jaipur	342,239	34,261,862	5.00
18 Sikkim	Gangtok	7,096	316,385	0.05
19 Tamil Nadu	Madras	130,058	48,408,077	7.06
20 Tripura	Agartala	10,486	2,053,058	0.30
21 Uttar Pradesh	Lucknow	294,411	110,862,013	16.18
22 West Bengal	Calcutta	88,752	54,580,647	7.97
Union Territories	Headquarters	Area (sq. km.)	Population 1981	Percent- tage to All India
1 Andaman & Nicobar Islands	Port Blair	8,249	188,741	0.03
2 Arunachal Pradesh	Itanagar	88,743	631,839	0.09
3 Chandigarh	Chandigarh	114	451,610	0.07
4 Dadra & Nagar Haveli	Silvassa	491	103,676	0.02
5 Delhi	Delhi	1,483	6,220,406	0.91
6 Goa, Daman & Diu	Panaji	3,814	1,086,730	0.16
7 Lakshadweep	Kavaratti	32	40,249	0.01
8 Mizoram	Aizwal	21,081	493,757	0.07
9 Pondicherry	Pondicherry	492	604,471	0.09

* Srinagar (Summer Capital), Jammu (Winter Capital)

† Uttar Pradesh, Bihar and Madhya Pradesh account for 34.0 per cent or more than one-third of the total population of India.

‡ Projected.

@ The total area of the country represents provisional Geographical area as on 31st March 1982, supplied by the Survey of India. The area includes 78,114 sq. km. under illegal occupation of Pakistan. 5,180 sq. km. illegally handed over by Pakistan to China and 37,955 sq. km. under illegal occupation of China.

ing mortality but a stable fertility. Group (ii) is next in the order of progression with a declining mortality. Their fertility is also on

the decline but at a slower rate than that of mortality. Consequently this group still qualifies for being on the high side, with a slightly

increasing trend in growth rate. Group (iii) shows a decline in both mortality and fertility.

There is a near parity between these rates which shows a declining trend in growth rates. Group (iv) shows a fertility which just

about compensates for loss in mortality, thus leading to a steady growth rate, which is sometimes called replacement rate. This group has thus reached the last stage in transition.

ANDHRA PRADESH

Area: 275,068 sq. km. **Capital:** Hyderabad. **Population:** 53,549,673. **Languages:** Telugu and Urdu. **Literacy:** 29.73.

Physiography. Andhra Pradesh is the fifth largest State in India, both in area and population. Bounded by MP and Orissa in the north, the Bay of Bengal in the east, T. Nadu and Karnataka in the south and Maharashtra in the west, AP forms the major link between the north and the south of India. The northern area of AP is mountainous with an annual rainfall of 45 to 50 inches. The highest peak *Mahendragiri* rises 4920 ft. above the sea level. As we go further south, the rainfall comes down to 20 inches annually. The climate is generally hot and humid. AP is principally fed by the south west monsoon, the north east monsoon contributing about one-third to the rainfall.

The *Krishna* and the *Godavari* are the major river systems in the State: The Godavari is the largest and the broadest river of South India. The Tungabhadra is an important tributary of the Krishna. Other important rivers are the Pennar, Vamsadhara and the Nagavali. All these rivers are rainfed, and are of great economic significance to the State because of their rich hydropower and irrigation potential.

History. The word 'Andhra' is equally applicable to the land, the people and the language, although the language in course of time developed a name of its own—*Telugu*.

The Andhras, originally an Aryan race, migrated to the south of the Vindhyas where they mixed with the non-Aryan stocks. Andhra Pradesh first enters history as part of the great Mauryan empire.

In the 13th century, the Kakatiyas, with their capital at Warrangal, dominated Andhra desa. In 1323, the Tughlak Sultan of Delhi captured the Kakatiya ruler and ended the dynasty. The Tughlaks never cared to

annex the Kakatiyan dominions and four local kingdoms arose out of the old Kakatiyan empire.

One of these kingdoms was Vijayanagar. The Vijayanagar empire stood as a bulwark against Muslim expansionism for more than 200 years. Vijayanagar had to contend with Muslim sultanates in the north time and again. Sometimes Vijayanagar joined one sultan against another. These tactics finally led to a grand alliance of the sultanates of Ahmadnagar, Bijapur, Golconda and Bidar against Vijayanagar. On 23rd January, 1565 the Deccan sultans humbled the mighty Vijayanagar army at the battle of Talikota.

The Qutb Shahis of Golconda laid the foundations of the modern city of Hyderabad. Emperor Aurangzeb routed the Qutb Shahis and appointed Asaf Jah as the governor of Deccan. As the Mughal Empire tottered under Aurangzeb's successors, the Asaf Jahis made themselves independent rulers under the title of Nizam. The Nizams became involved in the Anglo-French wars in the Deccan and had finally to enter into a subsidiary alliance with the British in 1800.

Andhra Pradesh is the first State in India that has been formed on a purely linguistic basis. When India became independent, the Andhras, that is, the Telugu-speaking people, were distributed in about 21 districts, 9 of them in the Nizam's Dominions and 12 in the Madras Presidency. On the basis of an agitation on Oct. 1, 1953, 11 districts of the Madras State were put together to form a new Andhra State with Kurnool as capital.

On Nov. 1, 1956 in accordance with the recommendations of the States Reorganisation Commission, the Andhra State was enlarged, by the addition of nine districts formerly in the Nizam's Dominions. Hyderabad, the former capital of the Nizam, was made the capital of the enlarged Andhra State.

AP thus consisted of three distinct regions:



(1) coastal region, made up of eight districts, generally called *Andhra*, (2) the interior region, consisting of four districts collectively known as *Rayalaseema* and (3) *Telengana* region, consisting of the capital of Hyderabad and nine adjoining districts.

From 1969 to 1972 AP was rocked by riots, first in Telengana, then in Andhra on the question of bifurcation of the State. The Central Government refused to consider the question of bifurcation. A six-point formula was put forward by the Prime Minister Mrs. Indira Gandhi as a compromise. The formula was generally accepted and peace was restored in the State.

The six-point formula has been incorporated into the Constitution as the Thirty-second Amendment 1973.

Administration. The legislature in the A.P. is unicameral, the Legislative Assembly

has 295 seats. A.P. Legislative Council was abolished from June 1, 1985.

Andhra is divided into 23 districts. Two new districts created are Ranga Reddy district. (August 15, 1979, from Hyderabad District) and Vizianagaram district (June 1, 1979 from Visakhapatnam and Srikakulam districts). The headquarters for Ranga Reddy District for the time being is Hyderabad City and for Vizianagaram district, Vizianagaram city.

Districts			
District	Area (sq. km.)	Population†	Head-quarters
Andhra Region			
Anantapur*	19125	2548012	Anantapur
Chittoor*	15763	2737316	Chittoor
Cuddapah*	15356	1933304	Cuddapah
E. Godavari	10940	3701040	Kakinada

Guntur	11377	3434724	Guntur
Krishna	8734	3048463	Machilipatnam
Kurnool	18799	2407299	Kurnool
Nellore	13058	2014879	Nellore
Prakasam	17620	2329571	Ongole
Srikakulam	5387	1959352	Srikakulam
Visakhapatnam	11161	2576474	Visakhapatnam
Vizianagaram	6539	1804196	Vizianagaram
W. Godavari	7780	2873958	Eluru
Telangana Region			
Adilabad	16133	1639003	Adilabad
Hyderabad	217	2260702	Hyderabad
Ranga Reddy	7493	1582062	Hyderabad
Karimnagar	11824	2436323	Karimnagar
Khammam	15866	1751574	Khammam
Mahaboobnagar	18419	2444619	Mahaboobnagar
Medak	9865	1807139	Sangareddy
Nalgonda	14242	2279685	Nalgonda
Nizamabad	7969	1679683	Nizamabad
Warrangal	12875	2300295	Warrangal
Total		53549673	

* Rayalaseema

† Census of India 1981.

State of Economy. A.P. has a widely diversified farming base, with a rich variety of cash crops. It is surplus in foodgrains and can rightly claim to be the granary of the south. Agricultural sector accounts for around 50% of the State's income and provides livelihood to 70% of the population. The crops extensively cultivated in the state are paddy, jowar, bajra, ragi, maize, groundnut, chillies, tobacco, cotton, castor and sugar cane.

A.P. leads all other states in the production of tobacco with a virtual monopoly of virginia tobacco. The production of tobacco in 1983-84 was 1.86 lakh tonnes and production of castor was 0.66 lakh tonnes. Production of foodgrain reached 118.81 lakh tonnes in 1983-84.

Andhra Pradesh which has for long been at the bottom of the industrial map of India today stands fifth in the country in terms of

industrial development, sixth in respect of employment, seventh in respect of output and eighth in respect of productive capital and value added. During 1982-83 there were 19,522 registered factories. The work on the steel plant at Visakhapatnam has also commenced. Foundation for the railway carriage repair workshop at Tirupati has been laid.

Tourist Centres. Andhra Pradesh is rich in historical monuments. It possesses many holy temples which attract large numbers of pilgrims and tourists.

Tirupati in Chittoor district houses one of the most famous temples in India. The presiding deity is known as Venkateswara. The main temple is situated on a hill-top, Tirumalai, and is a masterpiece of South Indian architecture.

The temple of Sriramachandra at Bhadrachalam, the Mallikarjunaswami temple at Srisailem, the Ahobalam temple, Srikurman temple and the Simhachalam temple are among the other famous temples of Andhra Pradesh. The main tourist attraction is the capital of the State, *Hyderabad*. The capital is in reality the twin cities of Hyderabad and Secunderabad linked together by the Hussain Sagar. Places of interest are the Char Minar built in 1591, Osmania University, State Museum and Art Gallery, Salarjung Museum, Health Museum and public gardens.

Another important centre of tourism is Golconda, about 5 miles from Hyderabad. The capital of the Qutb Shahi Sultans in the 16th century, Golconda is rich in historical monuments which include the famous Golconda Fort. Golconda was known the world over, as a rich mine of diamonds in the mediaeval times. The famous diamonds *Kohinoor* and *Pitt*, came from the diamond mines of Golconda.

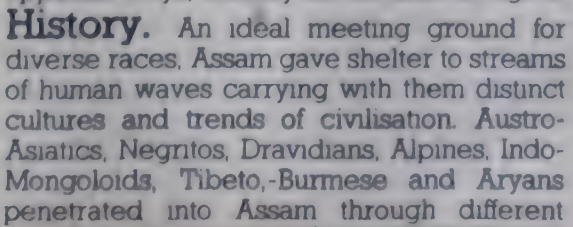
Governor: Kumud Ben Joshi, **Chief Minister:** N. T. Rama Rao. (Telugu Desam).

ASSAM

Area: 78,438 Sq.Km. **Capital:** Dispur.
Population: 19896843. **Language:** Assamese. **Literacy:** 36.7%.

Scholars are not agreed on the origin of the name "Assam". Some say that Assam is called

so, because of its unequal terrain—that is, hills interspersed with valleys. They rely on a similar-sounding Sanskrit word, meaning unequal. This explanation appears to be far fetched. A more acceptable version is that



routes and contributed in their own way towards the unique fusion of a new community which came to be known in later history as the Assamese. Assam, however, remained predominantly a land of the Tibeto-Burmese. The vast section of the people of Assam belong either to this stock or owe their origin to the fusion of this stock with other racial groups.

Assam, known in ancient lore as Kamarupa, originally included in addition to modern Assam, parts of modern Bengal and Bangladesh. Gauhati, the pulsating centre of Assam, an ancient town whose history goes back to the Puranic days. The city, anciently known as Pragjyotishpur, was said to have been founded by King Narakasur, who is mentioned in the Puranas and epics. His son Bhagadatta led a large elephant force to the battlefield of Kurukshetra, and fell fighting on the side of the Kauravas.

In the 13th century, the country was conquered by the Ahoms under the leadership of Sukapha, a prince of the Shan tribe, in the Upper Irravaddy Valley.

The advent of the Ahoms changed the course of Assam's history. Ahoms fought the local Kachari, Chutice and Moran kings and established their sway in course of time, over the whole of Brahmaputra Valley.

The Ahoms appointed Bharphakans (Viceroys) to rule Kamarupa and Gauhati became the capital of these Viceroys. The last of the Viceroys was Badanchandra, who in an ill-advised bid for power invited the Burmese to help him. The Burmese dislodged the Ahoms and dismissed their Viceroy, Badanchandra. The Ahoms appealed to the British for help.

The British defeated the Burmese in several battles, in what has since been called the First Burmese War. With the Treaty of Yandabo in 1826, the Burmese vacated Assam, leaving the British in possession. The conquered territory was placed under the administration of an Agent to the Governor General. In 1832 Cachar was annexed to Assam. In 1835, the Jaintia Hills were made part of Assam. Upper Assam was annexed to Bengal in 1839. In 1874 a separate province of Assam under a Chief Commissioner was created, with Shillong as Capital.

On the partition of India almost the whole of the predominantly Muslim district of Sylhet was merged with East Bengal (present Bang-

ladesh). Dewanagiri in North Kamarupa was ceded to Bhutan in 1951.

On the partition of Bengal in 1905, Assam was united to the eastern districts of Bengal under a Lt. Governor. From 1912 the Chief Commissionerhip of Assam was revived, and in 1921 a Governorship was created.

Assam lost a good deal of its former territory, as a result of political changes, from time to time.

In 1948, the North East Frontier Agency was separated from Assam, for security reasons. In 1963, Nagaland was carved out of Assam as a full-fledged State. On 21st Jan. 1972, Meghalaya was cut out of Assam, as a separate State and Mizoram became a Union Territory.

Administration. The Legislature consists of only one house—the Legislative Assembly. The State is divided into 16 districts.

Districts		
	Area in Sq. km	Headquarters
Barpeta	3,307.3	Barpeta
Cachar	5,102.2	Silchar
Darrang	3,465.3	Mangaldoi
Dhubri	2,745.5	Dhubri
Dibrugarh	7,023.9	Dibrugarh
Goalpara	2,843.8	Goalpara
Jorhat	6,400.0	Jorhat
Kamrup	6,648.7	Guwahati
Karbi Anglog	10,332.0	Diphu
Karimganj	1,839.0	Karimganj
Kokrajhar	4,716.5	Kokrajhar
Lakhimpur	5,646.4	Lakhimpur
Nagaon	5,561.0	Nagaon
North- Cachar Hills	4,890.0	Haflong
Sibsagar	2,602.9	Sibsagar
Sonitpur	5,255.2	Tezpur

Six new districts, inaugurated on 30 June 1983 are: Dhubri, Kokrajhar, Barpeta, Darrang, Jorhat and Karimganj.

State of Economy. Assam is rich in mineral wealth. It holds a unique position in the production of mineral oil. Other minerals found in the State are coal, limestone, refractory clay, dolomite and natural gas.

Of the agriculture-based industries, tea occupies an important place. There are nearly 750 tea plantations in the State. Petroleum and petroleum products amount to a

large share of country's total output of petroleum and natural gas. The state has two oil refineries and the 3rd with a Petrochemical Complex is under way. There is also a public sector fertilizer factory at Namrup. Other industries are Sugar, Jute, Silk, Paper, Plywood, rice and oil milling. Important cottage industries are handloom, sericulture, manufacture of cane and bamboo articles, carpentry, smithy and manufacture of brass utensils. An export oriented handloom project has been started at Sualkuchi to exploit the export potentialities of Eri and Muga.

Tourist Centres. Tourism is only of recent origin.

The Government of India has approved the following two travel circuits in the State: 1. Guwahati-Kaziranga-Sibsagar. 2. Guwahati-Manas.

The State Government has also, submitted a proposal for additional circuits: 1. Guwahati-Bhairabkunda-Orang-Bhaluking-Tezpur, 2. Guwahati-Diphu-Haslong-Silchar.

These circuits may be linked with Arunachal, Meghalaya, Manipur and Mizoram and will thus help the integrated development of tourism in the north-eastern region.

Governor: Bhisma Narayan Singh.

Chief Minister: Prafulla Kumar Mahanta (Asom Gana Parishad).

BIHAR

Area: 173,877 sq. km; **Capital:** Patna; **Population:** 6,99,14,734; **Language:** Hindi; **Literacy:** 26.20%.

The name 'Bihar' is a corrupt form of 'Vihara' which means a Buddhist monastery. Bihar, squeezed in between West Bengal, Orissa, MP and UP, reaches up to the Himalayas in the north and is completely landlocked. Bihar is bounded on the north by Nepal, on the south by Orissa, on the east by W. Bengal and on the West by MP and UP.

Physiography. Stretching from the Himalayan foothills in the north to Orissa in the south, Bihar suffers all the vicissitudes of changing seasons. It gets the worst of the cold and the worst of the heat and plenty of floods into the bargain.

The most striking geographical feature of Bihar is the sharp division between north and south. The northern portion is almost entirely a level tract, while the southern region is wooded and hilly. North Bihar is an extremely fertile strip of land, the land being watered by the rivers Sarayu, Gandak and Ganga.

Southern Bihar, especially in and around the districts of Chota Nagpur and Santhal Parganas, is thickly wooded and consists of a succession of hills. The elevation varies from 300 to 1300m., the highest peak being 1372m.

History. Bihar has a very ancient glorious and colourful history. Bihar was the home state of the Mauryan emperors. Under Asoka

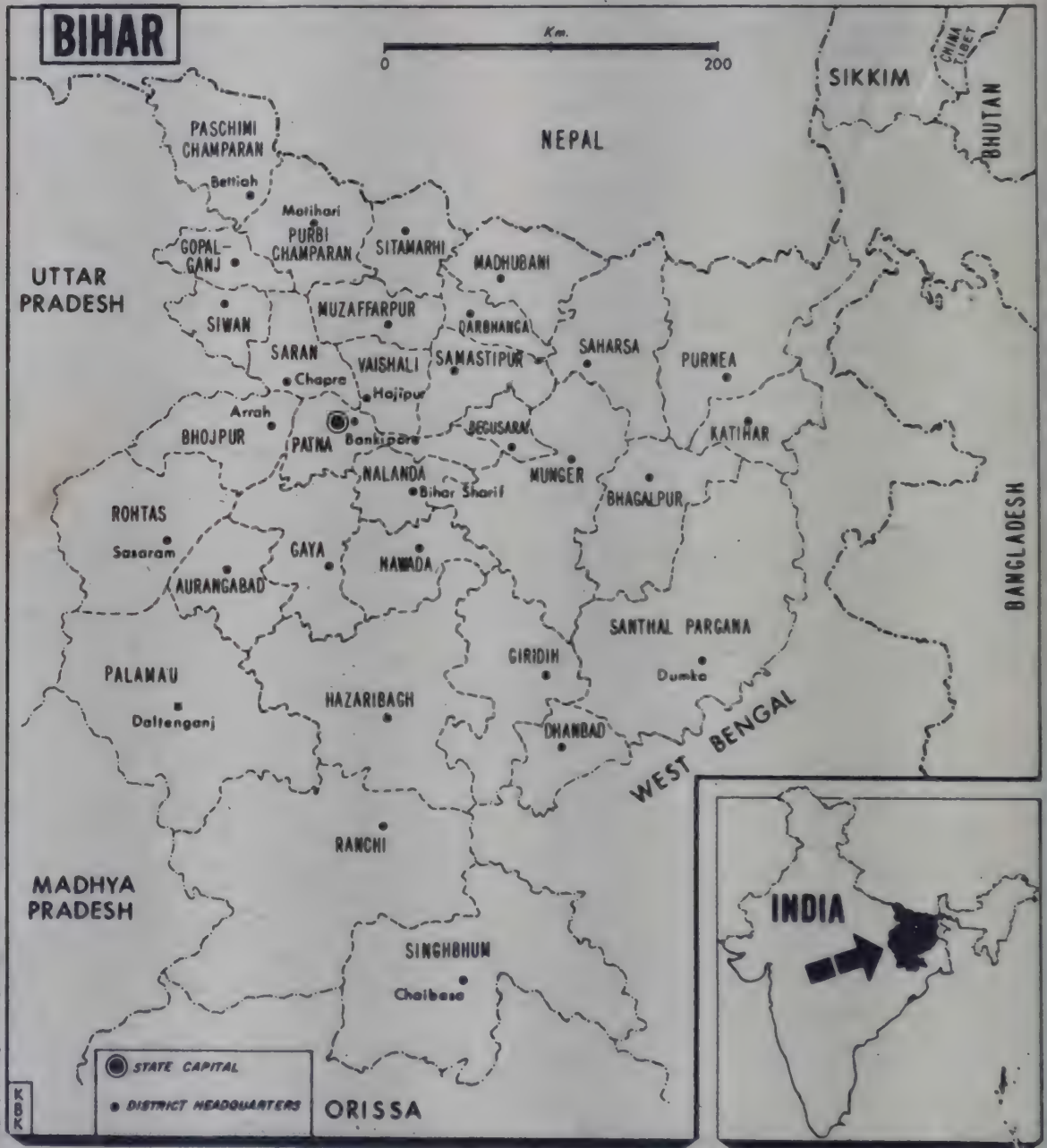
the Great, Magadha and its capital Pataliputra became famous all over the world. With the death of Asoka, its fortunes declined. However, under the Gupta emperors it regained its lost glories. Under the Sultans of Delhi, and later under the Moghul emperors, Bihar was reduced to the status of a province, whose only importance was that it lay on the route from Bengal to Delhi.

When Sher Shah, a Behari himself, drove out Humayun and occupied the throne of Delhi, Bihar once again shot into lime-light. Sher Shah founded the city of Patna, on the site of the ancient capital Pataliputra and gave the country an efficient administration. Bihar enjoyed a period of peace and stability under Akhbar the Great and later Moghuls.

With the decline of the Moghul empire, Bihar passed into the hands of the Nawabs of Bengal. The British wrested the country from the Nawab of Bengal, by the decisive battle at Buxar in Bihar (1764). Under the British Bihar was first a part of the Bengal Presidency. In 1911, Bihar along with Orissa, was separated from the Presidency of Bengal. In 1936, Bihar and Orissa became separate provinces.

Administration. Bihar is one of the medium-sized states of India being the ninth in area. But in population it is the second biggest State in India, next only to Uttar Pradesh.

The Legislature consists of two houses—the



Legislative Assembly and the Legislative Council. The State is divided in to 38 districts.

Districts

District	Area in sq. km.	Population	Head Quarters
Patna	3,202.0	3,019,201	Patna
Nalanda	2,367.0	1,641,325	Biharsharif
Nawada	2,494.0	1,099,177	Nawada
Gaya	6,545.0	3,134,175	Gaya
Aurangabad	3,305.0	1,237,072	Aurangabad
Rohtas	7,213.0	2,366,325	Sasaram
Bhojpur	4,098.0	2,407,600	Arrah
Saran	2,641.0	2,084,322	Chapra
Siwan	2,219.0	1,778,930	Siwan
Gopalganj	2,033.0	1,362,123	Gopalganj
Paschim Champaran	5,228.0	1,972,610	Bettiah
Purab Champaran	3,968.0	2,425,501	Mothari
Sitamarhi	2,643.0	1,932,147	Sitamarhi
Muzaffarpur	3,172.0	2,357,388	Muzaffarpur
Vaishali	2,036.0	1,662,527	Hajipur
Begusarai	1,918.0	1,456,343	Begusarai

Samastipur	2,904.0	2,116,876	Samastipur
Darbhanga	2,279.0	2,008,193	Darbhanga
Madhubani	3,501.0	2,325,844	Madhubani
Saharsa	4,071.8	1,989,770	Saharsa
Madhepura	1,788.5	964,033	Madhepura
Purnia	7,943.0	3,595,707	Purnia
Katihar	3,057.0	1,428,622	Katihar
Monghyr	6,398.7	2,546,774	Monghyr
Khagaria	1,485.8	768,653	Khagaria
Bhagalpur	5,589.0	2,621,427	Bhagalpur
Santhal Pargana	5,518.3	1,215,542	Dumka
Deoghar	2,478.6	708,828	Deoghar
Godda	2,110.4	7,13,405	Godda
Sahebganj	3,405.4	1,079,753	Sahebganj
Dhanbad	2,996.0	2,115,010	Dhanabad
Giridih	6,892.0	1,731,462	Giridih
Hazaribagh	11,165.0	2,198,310	Hazaribagh
Palamu	12,749.0	1,917,528	Daltonganj
Ranchi	7,574.1	1,823,415	Ranchi
Gumla	9,077.1	1,017,231	Gumla
Lohardaga	1,490.9	2,29,786	Lohardaga
Singbhum	13,440.0	28,61,799	Chaibasa

State of Economy: Bihar is ideally suited for agriculture. It has 115 lakh hectares cultivated land out of 174 lakh total ha. Presently only 85 lakh hectare land is being cultivated. The principal foodgrain crops are rice, wheat, maize, rabi and pulses. Main cash crops are sugarcane, oilseeds, tobacco, jute and potato. 1984-85 total Production-110 lakh tonnes. 1985-86 total Production expected 121.50 lakh tonnes.

In minerals Bihar in the richest State in India, accounting for nearly 40% of India's total production. Industries based on iron ore, coal, etc. are spread out around Jamshedpur, Bokaro, etc.

As for industrial development for 1985-86 allocation of Rs. 41 crore has been made against Rs. 28 crore made available during

last financial year. Letter of intent for manufacture of 50,000 tonnes of Caprolactum has already been cleared by Govt. Based on aromatics this will be set up at Barauni. The Bihar State Industrial Development Corporation's new coming projects are Sponge Iron at Chandi, G.I. Sheets at Jamui, Nylon in Bhojpur, Solvent extraction plant at Latehar, Watch factory at Ranchi, Cement Plant at Patratu, Transmission Tower at Jasidhi, Bihar fasteners at Gaya, etc. The 'single window' system for extending all assistance to industrialists has been introduced.

Tourist Centres. Places of tourist interest are Rajgir, Bodh Gaya, Jamshedpur, Bokaro, Nalanda, Patna, Ranchi, Sasaram, Vaishali, Hazaribagh, Betla, Bhimbandh, etc. Bodh Gaya, near Gaya in Bihar, is a Buddhist centre of pilgrimage. It contains the famous ancient temple near the Bodhi Tree under which Buddha got enlightenment.

Jamshedpur and Bokaro are steel towns.

Nalanda was one of the great seats of learning in ancient India and contains the ruins of many Buddhist temples and monasteries.

Patna, capital of Bihar, stands of the site of the ancient city of Pataliputra.

Sasaram is famous on account of the magnificent tomb of Sher Shah Suri, Emperor of Delhi.

Hazaribagh and Betla have national parks and wild life sanctuaries. Vaishali was the seat of ancient Lichavi Republic.

Governor: Dr. A. R. Kidwai; **Chief Minister:** Bindeshwari Duby (Congress).

GUJARAT

Area: 1,96,024 sq.km. **Capital:** Gandhinagar. **Population:** 3,40,85,799. **Language:** Gujarati. **Literacy:** 43.70%.

Gujarat, lying in the north-west corner of India, is the tenth in point of population (1981). It is bounded on the north-west by Pakistan, on the north by Rajasthan, on the east by MP and on the south and south-east by Maharashtra.

Physiography. The State of Gujarat occupies the northern extremity of the Western seaboard of India. The State comprises

three geographical regions. (1) The peninsula, traditionally known as Saurashtra. It is essentially a hilly tract sprinkled by low mountains. (2) Kutch on the north-east is barren and rocky and contains the famous Ranns (desert) of Kutch, the big Rann in the north and the little Rann in the east. (3) The mainland extending from the Rann of Kutch and the Aravalli Hills to the river Damanganga is on the whole a level plain of a alluvial soil.

The plains of Gujarat are watered by big rivers like Sabarmati, Mahi, Narmada, and

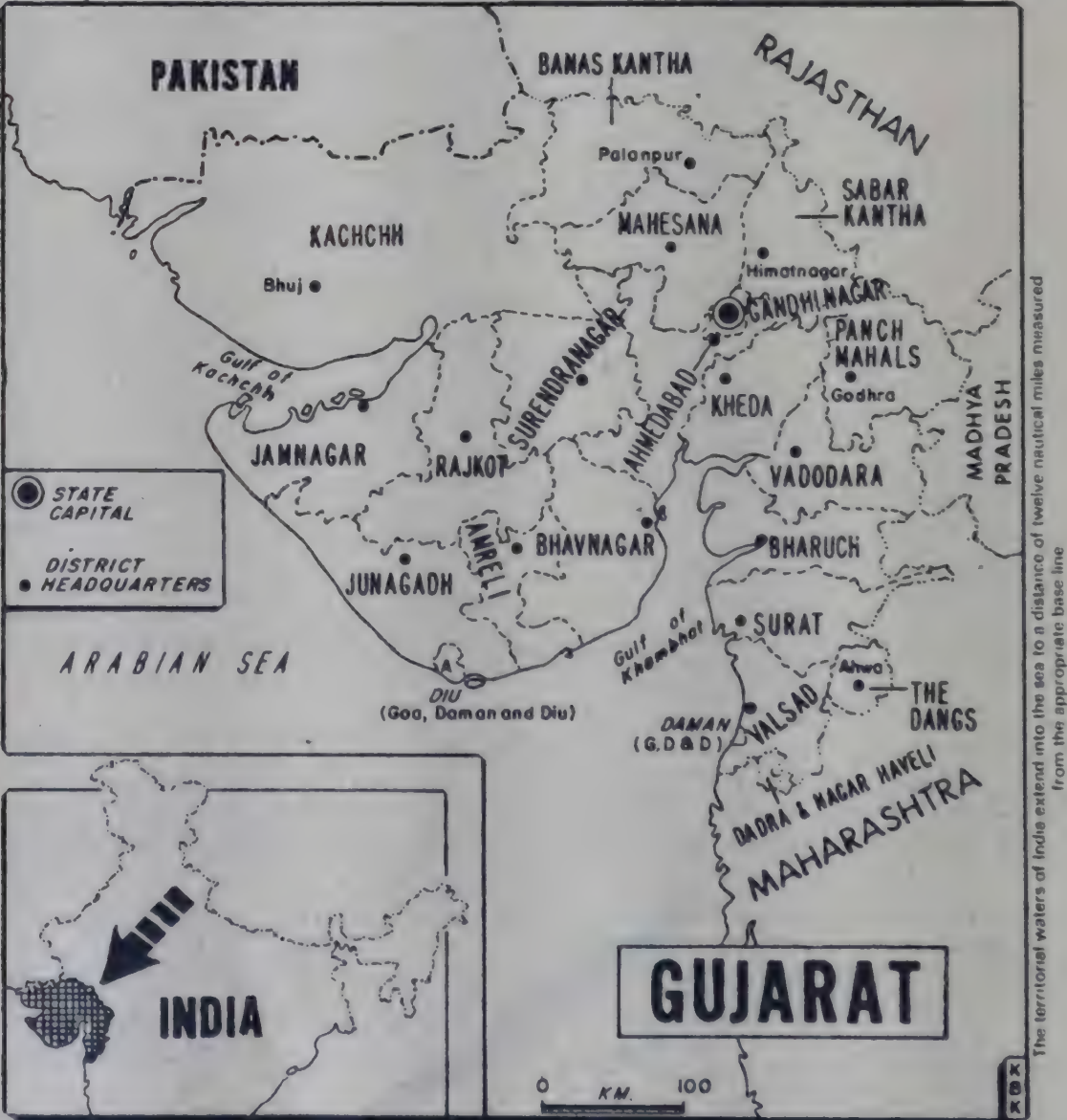
Tapti and by smaller rivers like Banas, Saraswathi and Damanganga. The rainfall in the state, except in the arid zones of Surendranagar and north Gujarat, varies between 65 and 127 cm.

As the Tropic of Cancer passes through the northern border of Gujarat, the state has an intensely hot or cold climate. But the Arabian sea and the Gulf of Cambay in the West and the forest-covered hills in the east soften the rigours of climatic extremes.

History. The early history of Gujarat is lost in antiquity and is intermingled with

myths and legends. In historical times, we find Gujarat as a part of the great empires of India—the Mauryan, the Gupta and the lesser empires of later times. The foundations of modern Gujarat were laid in the 10th century by Mulraj Solanki a ruler of the Chalukyan dynasty. By the end of the 13th century, Gujarat passed under Muslim rule. As a result, Gujarat evolved a happy synthesis of Hindu and Muslim cultures.

Administration. Gujarat has a unicameral legislature, the Legislative Assem-



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bly, which has 182 elected members. The State is divided into 19 districts.

Districts

District	Area (Sq Km.)	Popu- lation	Head quarters
Ahmedabad	8,707	38,75,794	Ahmedabad
Amreli	6,760	10,79,097	Amreli
Banaskantha	12,703	16,67,914	Palanpur
Bharuch	9,038	12,96,451	Bharuch
Bhavnagar	11,155	18,79,340	Bhavnagar
Gandhinagar	649	2,89,088	Gandhinagar
Jamnagar	14,125	13,93,076	Jamnagar
Junagadh	10,607	21,00,709	Junagadh
Kheda	7,194	30,15,027	Kheda
Kachchh	45,652	10,50,161	Bhuj
Mahesana	9,027	25,48,787	Mahesana
Panchmahals	8,866	23,21,689	Godhra
Rajkot	11,203	20,93,094	Rajkot
Sabarkantha	7,390	15,02,284	Himmatnagar
Surat	7,657	24,93,211	Surat
Surendranagar	10,489	10,34,185	Surendranagar
Dangs	1,764	1,13,664	Ahwa
Vadodara	7,794	25,58,092	Vadodara
Valsad	5,244	14,74,136	Valsad

State of Economy. Gujarat ranks the first in the country in the production of cotton and groundnut and second in the production of tobacco.

Cotton and groundnut have found good markets and provide a foundation for important industries like textiles, oil and soap. Other important cash crops are isabgul, cummin, sugarcane, mangoes and bananas. The chief food crops of the state are paddy, wheat and bajra. Jowar and maize are produced in local areas.

In 1983-84 production of cotton was 14.44 lakh bales, groundnut 15.05 lakh tonnes and foodgrains 55.13 lakh tonnes. Gujarat has 19.66 lakh hectares of land under forest.

Gujarat has a dominant textile industry. New industries, which are coming up, are chemicals, petrochemicals, fertilizers, drugs and pharmaceuticals, dye-stuffs and engineering units of multiple types.

The state is a major producer of inorganic chemicals such as soda-ash and caustic soda as well as chemical fertilizers. It has the

largest petro-chemical complex in the country.

The dairy industry has made tremendous advance and the state accounts for nearly 63 percent of infant milk produced in the country.

Exploration and production of oil and natural gas in Ankleshwar, Cambay and Kalol and oil refinery at Koyali are other industrial achievements. Near Bharuch Gujarat Narmada Valley Fertilizer Company has achieved great success. Ankleshwar industrial estate is humming with a number of industries. On the coastal areas of Saurashtra ship-breaking yards have taken shape at Alang and Sachana. Jamnagar, Porbander, Jafraabad, Bhavnagar, etc. are busy with new industries, trade and business.

Gujarat is a major salt producing state and its production forms as much as 60 per cent of the country's output.

There are 6 major plants in the State. The number of working factories has grown from 3,649 in 1960 to 12,586 in 1983. The number of small scale units has gone up from 2,169 in 1961 to over 60,000 units in 1985. The non-resident Indians have invested more than Rs. 127.96 crore in about 275 units in Gujarat.

Tourist Centres. Gujarat has 4 national parks and 11 sanctuaries. The game sanctuary at Gir, the sacred temples of Dwaraka and Somanath, Palitana, the picturesque mountain city of Jain Temples on about 2000 feet high Shetrunjaya hills, Udwa-da, the oldest place of the Fire temple of Parsees in India, the 5000-year-old archaeological finds at Lothal, the 11th century Sun Temples at Modhera, bird sanctuary at Nal Sarovar, architectural monuments of Indo-Saracenic style at Ahmedabad and other places, the national shrine of Mahatma Gandhi at Sabarmati Ashram, Ahmedabad, Saputara hills in South Gujarat are just a few of the varied attractions in the state.

Governor: B.K. Nehru. **Chief Minister:** Madhavsinghji Fulsinghji Solanki (Congress).

HARYANA

Area: 44,212 sq. km.; **Capital:** Chandigarh; **Population:** 12,922,618; **Language:** Hindi; **Literacy:** 35.84%.

The State is bounded by UP in the east, Punjab on the west, Himachal Pradesh in the north and Rajasthan in the south. The Union

Territory of Delhi juts into Haryana and is encompassed by it on three sides.

Physiography. Haryana can be divided into two natural areas, Sub-Himalayan terai and the Indo-Gangetic plain. The plain is fertile and slopes from north to south with a height above the sea level averaging between 700 and 900 ft. The south west of Haryana is dry, sandy and barren. Haryana has no perennial rivers like its parent state Punjab or its eastern neighbour UP. In this respect, it has more affinity to its southern neighbour, Rajasthan. The only river which flows through Haryana is the Ghaggar, which passes through the northern fringes of the state. This river identified by some historians as the river Drishavaditi of Vedic fame is not perennial. Rainfall is meagre, particularly in the districts of Mahendragarh and Hissar.

For most of the year, the climate of Haryana is of a pronounced character, very hot in summer and markedly cold in winter. The maximum temperature is recorded in the months of May and June when it goes upto as high as 46 degrees C. The temperature falls to the lowest in January.

There are two well-marked seasons of rainfall in the State: (i) the monsoon period falling from the middle of June till September on which autumn crops and spring sowing depend, and (ii) the winter rains which occur from December to February. The Dec.-Feb. rains, though often insignificant in quantity, yet materially affect the prosperity of the spring harvest.

History. Haryana has a proud history going back to the Vedic age. The State was the home of the legendary Bharata dynasty, which has given the name Bharat to India. Haryana is immortalised in the great epic *Mahabharata*. Kurukshetra, the scene of the epic battle between the Kauravas and the Pandavas, is situated in Haryana. The state continued to play a leading part in the history of India till the advent of the Muslims and the rise of Delhi as the imperial capital of India. Thereafter, Haryana has functioned as an adjunct to Delhi and practically remained anonymous till the first war of Indian independence in 1857 when the people of Haryana joined the leaders of the Indian revolt against the British Government.

When the rebellion was crushed and the British administration reestablished, the Nawabs of Jhajjar and Bahdurgarh, the Raja of Ballabgarh and Rao Tula Ram of Rewari of the Haryana region were deprived of their territories. Their territories were either merged with the British territories or handed over to the rulers of Patiala, Nabha and Jind. Haryana thus became a part of the Punjab province.

The modern State of Haryana came into being on November 1, 1966 as a result of the re-organisation of the old Punjab State into two separate states. It was formed as a linguistic state, on the pattern of other states in India, the Hindi-speaking areas of Punjab having been assigned to it.

Administration. The legislature consists of only one house—the Legislative Assembly. There are 90 members in the Legislative Assembly (Vidhan Sabha).

The State is divided into 12 districts.

Districts

District	Area sq. km.	Population	Head- quarters
Ambala	3832	1409463	Ambala
Kurukshetra	3740	1130026	Kurukshetra
Karnal	3721	1322826	Karnal
Jind	3306	938074	Jind
Sonepat	2206	846765	Sonepat
Rohtak	3841	1341953	Rohtak
Faridabad	2150	1000859	Faridabad
Gurgaon	2716	849598	Gurgaon
Mahendragarh	3010	959400	Narnaul
Bhiwani	5099	920052	Bhiwani
Hissar	6315	1496534	Hissar
Sirsa	4276	707068	Sirsa

State of Economy. Agricultural development in Haryana has been tremendous since independence. The production of foodgrains, sugarcane (gur), oilseeds and cotton rose from 25.92 lakh tonnes, 5.10 lakh tonnes, 0.92 lakh tonnes and 3.05 lakh bales of 170 kg each in 1966-67 to 66.59 lakh tonnes, 6 lakh tonnes, 1.50 lakh tonnes and 5.50 lakh bales of 170 kg each respectively in 1982-83. Fertilizer consumption increased from 0.13 tonnes in 1966-67 to 2.72 lakh tonnes in 1982-83.

Haryana was the first state to introduce crop insurance scheme in north India. Dairy industry is also highly developed.

The major industries are cement, sugar, paper, cotton, textiles, glassware, brassware, cycles, tractors, motor cycles, time-pieces, automobile tyres and tubes, sanitaryware, television sets, steel tubes, hand tools, cotton yarn, refrigerators, vanaspati ghee and canvas shoes, etc. A factory of the Hindustan Machine Tools producing tractors is located at Pinjore.

In all, there are at present more than 42,000 small scale industrial units in Haryana

as well as 308 large and medium scale units. Exports rose to Rs. 150 crore in 1982-83.

Tourist Centres. Raj Hans, Badkhal Lake, Surajkund, Dabchik, Sultanpur, Barbet, Sohna and Pinjore. Haryana has a network of 32 tourist complexes.

The Golden Triangle of India—Delhi—Agra—Jaipur, and other places of tourist interest in the North viz. the Kashmir Valley, Simla, Amritsar, Chandigarh and Bhakra—



Nangal hold great charm for potential tourists, both foreign and home. Haryana girdles Delhi from three sides with all the national highways to these tourist centres running through it.

'Hotel Raj Hans' stands above Surajkund and overlooks the Peacock Lake and bestows its comforts to foreign and domestic

tourists coming to Delhi or Haryana.

Haryana Tourism has repeatedly won awards from the Pacific Area Travel Association and the Travel Agents Association of India.

Governor: S. M. H. Burney. **Chief Minister:** Bhajan Lal (Congress).

HIMACHAL PRADESH

Area: 55,673 sq. km.; **Capital:** Shimla; **Population:** 4,280,818; **Language:** Hindi and Pahari; **Literacy:** 41.94%.

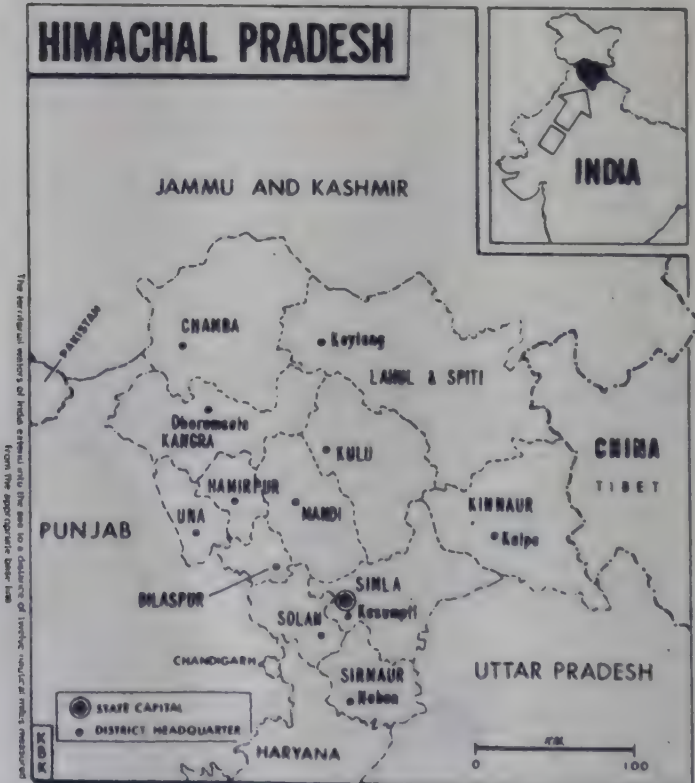
Himachal Pradesh became a fullfledged State of the Indian Union on January 25, 1971. With an area of 55,673 sq. km. it is larger than Punjab, Haryana or Kerala, but in population it stands much below. Historically, the 18th State in the Union, Himachal Pradesh is also the 18th in population (1981 census) but the 14th in area.

Physiography. Himachal Pradesh is situated in the north west corner of India, right in the lap of the Himalayan ranges. It is

surrounded by Jammu and Kashmir in the north, Uttar Pradesh in the south east, Haryana in the south and Punjab in the west. In the east, it forms India's boundary with Tibet.

The State is almost entirely mountainous with altitudes ranging from 460 to 6400 metres above sea level. It has a deeply dissected topography, a complex geological structure and a rich temperate flora in sub-tropical latitudes.

Physiographically, the State can be divided into two regions, southern and northern. The southern part of Himachal Pradesh is almost as hot as the plains, while the



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northern region has a temperate summer and a winter with extreme cold and heavy snowfall. The districts of Shimla and Sirmaur have alluvial soil, while the remaining ten districts have forest and hill soils. The normal rainfall of Himachal is 181.6 cm. Maximum rainfall is noticed at Dharmasala in Kangra district.

Himachal Pradesh is drained by a number of rivers, the most important of which are Chenab, Ravi, Beas, Sutlej and Yamuna. All these rivers are snow-fed and hence perennial. Besides, the natural reservoirs and the large drops available in the river courses provide immense potential for hydel power generation at a low cost.

History. Himachal Pradesh was originally formed as a centrally-administered Territory on April 15, 1948 by the integration of some thirty and odd Punjab Hill States. In 1951, it became a 'Part C' State Under a Lt. Governor, with a Legislative Assembly of 36 members and a Cabinet of three ministers. In 1954, Bilaspur, another 'Part C, State was merged with Himachal Pradesh and the strength of the Assembly was raised to 41 members.

In 1956, the States Re-organisation Committee recommended the merger of Himachal Pradesh with Punjab. But the people of Himachal Pradesh so stoutly opposed the merger that it was not put into effect.

Till October, 1966 Himachal Pradesh consisted of only six hill districts—Mahasu, Mandi, Chamba, Sirmaur, Bilaspur and Kinnaur. In November, 1966, it was enlarged by the addition of some of the hilly areas of Punjab—Shimla, Kangra, Kulu, Lahaul and Spiti districts and the Nalagarh tehsil of Ambala district and areas of Hoshiarpur and Gurdaspur districts.

Himachal Pradesh was re-organised into 10 districts and declared a State on January 25, 1971 with Shimla as its capital. In 1972-73, the districts were reshuffled bringing up their number to 12.

Administration. There is only one house of legislature, i.e., Vidhan Sabha, with 68 members.

The State is divided into the following 12 districts.

Districts

District	Area (sq. km.)	Population 1981	Density per (sq. km.)
Bilaspur	1167	247368	212
Chamba	6528	311147	48
Hamirpur	1118	317751	284
Kangra	5739	990758	173
Kinnaur	6401	59547	9
Kulu	5503	238734	43
Lahaul & Spiti	13835	32100	2
Mandi	3950	644827	163
Shimla	5131	510932	100
Sirmaur	2825	306952	109
Solan	1936	303280	157
Una	1540	317422	206
STATE	55673	4280818	77

State of Economy. Agriculture and horticulture are the mainstay of Himachal's economy as 76 per cent of people are engaged in these pursuits. Irrigated area forms 26 per cent of the net area sown. However, the agroclimatic conditions in the state are more suitable for growing a wide variety of fruits and cash crops like seed potatoes, ginger, vegetable seeds, apples, stone fruits, etc. Wheat, maize and paddy are the major cereal crops under cultivation. The production of food grains during 1983-84 was about 12 lakh tonnes as against 7.01 lakh tonnes during 1966-67 when the State was reorganised.

The State continues to be industrially backward despite vast natural resources endowment and plentiful availability of cheap hydel power. At the end of 1984-85, there were about 6420 small scale industrial units in organised sector employing about 41,000 persons besides numerous cottage and village industrial units. The commissioning of the most modern and sophisticated fruit processing plant at Parwanoo with a capital outlay of about Rs. 4.00 crore has been a landmark in the history of fruit processing in India.

As a result of various concessions/incentives, the pace of industrialization picked up and 58 medium and large scale projects were approved. Among major and medium industries are Nahan Foundry, Nahan, Rosin and Turpentine factories at Nahan and Bilaspur; Mohan Meakin Breweries, Solan; United Diamonds Ltd., Parwanoo. District Industries Centres in all the 12 districts are functioning.

Tourist Centres. Himachal Pradesh is studded with a number of hill stations which are refreshingly cool in summer. They offer to the tourists a quick holiday amidst breath-taking scenery. Shimla, Dalhousie, Dharmasala, Kulu, Kasauli, Solan, Chail and Kufri are some of the famous hill stations.

Himachal Pradesh abounds in wild life among which are some rare species like

musk deer, ibex, thar, Himalayan brown bear and snow leopard among animals and monal, tragopan, kokiash and snowcocks among birds. The rivers offer ideal fishing grounds for trout in Katrain, Rohru and Barot and for masheer in Maryoga, Karganuaud and Dedahu.

Governor: Hokishe Sema. **Chief Minister:** Vir Bhadra Singh (Congress).

JAMMU & KASHMIR

Area: 2,22,236; **Capital:** Srinagar (Summer) Jammu (Winter); **Population:** 5,987,389; **Language:** Urdu, Kashmiri, etc.; **Literacy:** 26.17%.

Physiography. The State lies in the extreme north of the country and is bounded on the north by China, on the east by Tibet and on the south by Himachal Pradesh, Punjab and Pakistan. The official language is Urdu; other commonly spoken languages are Kashmiri, Dogri, Balti, Ladakhi and Punjabi.

History. The State of Jammu and Kashmir which had earlier been under Hindu rulers and Muslim sultans, became part of the Moghal Empire under Akbar. After a period of Afghan rule from 1756, it was annexed to the Sikh Kingdom of the Punjab in 1819. In 1846 Ranjit Singh made over the territory of Jammu to Maharaja Gulab Singh. After the decisive battle of Sabroon in 1846 Kashmir also was made over to Maharaja Gulab Singh under the Treaty of Amritsar. British supremacy was recognised until the Indian Independence Act 1947.

When all States decided on accession to India or Pakistan, Kashmir asked for standstill agreements with both. In the meantime, the state became subject of an armed attack from Pakistan and Maharaja acceded to India on 26th October, 1947 by signing the instruments of accession. India approached the U.N. in January, 1949. Another round of war between the two countries in 1965 was followed by the Tashkent Declaration in January 1966.

Following the Liberation movement in the former eastern wing of Pakistan, Pakistan attacked India in December, 1971, followed by the Shimla Agreement in July, 1972. A new

line of control was delineated bilaterally to replace the cease-fire line between the two countries in Jammu and Kashmir.

The Maharaja's son Yuvraj Karan Singh took over as Regent in 1950 and on the ending of hereditary rule (17th October, 1952) was sworn in as a Sadar-i-Riyasat. On his father's death (26th April, 1961) Yuvraj Karan Singh was recognised as Maharaja by the Indian Government. He decided, however, not to use the title.

Administration. The Constitution of the state came into force in part on 17th November, 1956 and fully on 26th January, 1957. The constitution provides for a bicameral Legislature (i) the Legislative Assembly (2) the Legislative Council.

The State comprises 14 districts of which 6 each fall in Jammu and Kashmir provinces and two in Ladakh region.

Districts

District	Area (sq. km.)	Population	Head- quarters
Anantnag	3,984	6,56,351	Anantnag
Badgam	1,371	3,67,262	Badgam
Baramula	4,588	6,70,142	Baramula
Doda	11,691	4,25,262	Doda
Jammu	3,097	9,43,395	Jammu
Kargil	14,036	65,992	Kargil
Kathua	2,651	3,69,123	Kathua
Kupwara	2,379	3,28,743	Kupwara
Ladakh	82,665*	68,380	Leh
Pulwama	1,398	4,04,078	Pulwama
Punch	1,674	2,24,197	Punch
Rajauri	2,630	3,02,500	Rajauri
Srinagar	2,228	7,08,328	Srinagar
Udhampur	4,550	4,53,636	Udhampur

* Includes 37,555 sq. km. under illegal occupation of China.



State of Economy. Agriculture is the mainstay of the State economy, as about 80 per cent of the population depend on it. Paddy, wheat and maize are the major crops. Barley, bajra and jowar are cultivated in some parts. Gram is grown in Ladakh.

Area targetted to be covered under high-yielding varieties in 1983 was 253,000 hectares under paddy, 198,000 hectares under wheat, and 65,000 hectares under maize. Area under high yielding varieties during 1984 is targetted to be brought over 5.15 lakh hectares. Food grains production is expected to reach 14.25 lakh tonnes in 1984-85 from 11.11 lakh tonnes in 1979-80.

The State Government accords high priority to the development of handicrafts and handlooms sectors. Kashmir handicrafts have always been a byword for excellence. The tradition of crafting papier mache, wood carving, carpet, shawls, etc. is very old in Kashmir. This sector provides employment to about 1.7 lakh people. Kashmir handicrafts

particularly carpets earn substantial foreign exchange for the country. In 1982-83 Kashmir handicrafts worth Rs. 35.00 crore were exported.

Tourist Centres. Kashmir is the paradise for tourists, both international and domestic. Main centres of attraction are Srinagar, Pahalgam, Gulmarg, Sonamarg, etc. Among places of pilgrim interest are Amarnath, Vaishno Devi.

The tourist industry in the state has registered a phenomenal growth during the past decades. During 1975-76, over Rs. 60 lakh were spent on this sector and in 1984-85 plan expenditure is expected to be Rs. 550 lakh. In the 6th Plan an outlay of Rs. 2200 lakh was approved for the promotion of tourism. The actual expenditure incurred in the 6th Plan upto end of March, 1984 is Rs. 2178.226 lakh. In the 7th Five-Year Plan, an outlay of Rs. 5562.60 lakh has been proposed.

Governor: Jagmohan, **Chief Minister:** G. M. Shah. (National Conference).

KARNATAKA

Area: 1,91,791 sq.km.; **Capital:** Bangalore;
Population: 3,71,35,714; **Language:** Kannada;
Literacy: 37.41%.

Karnataka is the eighth largest state in India both in area and population. It was formerly known as Mysore. On November 1,

1973 the name *Mysore* was changed to *Karnataka* under The Mysore State (Alteration of Name) Act 1973.

The change is much more than a change in nomenclature. It is the revival of a great image of the region which, under the name of Karnataka, had attained glorious heights in history.

Physiography. Karnataka is situated on the western edge of the Deccan plateau and has for its neighbours Maharashtra and Goa on the north, Andhra Pradesh on the east and T.Nadu and Kerala on the south. On the west, it opens out on the Arabian Sea.

Physiographically, the state can be divided into four regions: (1) The Coastal Region, (2) the Malnad, (3) the Northern plains and (4) the Southern plains.

The two important river systems of Karnataka State are the Krishna and its tributaries

(Bhima, Ghataprabha, Malaprabha, Tungabhadra and Vedavati) in the north, and the Kaveri and its tributaries (Hemavati, Shimsha, Arkavati, Lakshmana Thirtha and Kabi-ni) in the south.

Both these rivers flow eastward and fall into the Bay of Bengal, the Krishna passing through Andhra Pradesh and the Kaveri traversing Tamil Nadu.

A number of smaller rivers flow westward into the Arabian Sea. Of these Sharavati, Kalinadi and Netravati are important to Karnataka. They are being tapped for hydro-power.

As most of these rivers pass through other States notably Andhra Pradesh, Kerala and T.Nadu, there are frequent disputes as to water rights between Karnataka and the other States.

History. The name Karnataka is derived from Karunadu, literally, lofty land. As much



of Karnataka is high plateau land, the name is entirely justified. The history of Karnataka goes back to the dim days of the epics. The capital of Bali and Sugreeva, 'monkey kings' of the Ramayana, is said to have been Hampi in Bellary district. Vatapi, associated with the Sage Agastya, is obviously Badami in Bijapur district.

In the 4th century B.C. Karnataka was part of the great Mauryan Empire. Siwamagiri (Kanakagiri in Raichur district) is said to have been the southern capital of the Mauryas. About 30 B.C. a local dynasty, Satavahana, came to power. The Satavahana Empire lasted nearly 300 years. With the disintegration of the Satavahana dynasty, the Kadambas came to power in the north, and the Gangas in the south. The gigantic monolithic statue of Gomateswara at Sravanabelagola is considered to be a monument of the Ganga period.

By the beginning of the sixth century A.D., the Chalukyas established a new empire. After the Chalukyan empire, the Yadavas of Devagiri and the Hoysalas of Dwarasamudra divided Karnataka between them.

In the 14th century, the great Vijayanagar empire was established. It was an age of glory and prosperity. A confederation of the Muslim sultans of the Deccan destroyed the Vijayanagar Empire in 1565 (Battle of Talikota). The vast ruins at Hampi, near Hospet, remain to-day as sombre reminders of Vijayanagar glory.

In 1399 A.D. Yaduraya, the ruler of a small principality, Mysore, founded the Wodeyar dynasty. Raja Wodeyar (A.D. 1578—1612) enlarged the principality into a mighty kingdom, with Srirangapatnam as his capital. The Wodeyars were overthrown by Hyder Ali, the intrepid Muslim general of Mysore. With the defeat of Tipu, the son of Hyder Ali, by the British, the Wodeyars were restored to power as a feudatory of the British.

During British rule, the Karnataka area was distributed among the Princely States of Mysore, Hyderabad, and the British provinces of Bombay and Madras and the small principality of Coorg.

The formation of the present State represents the fulfilment of the age-old aspirations of Kannada-speaking people to come

together in a single State. The old Kingdom of Mysore formed the nucleus of this new state. Under the States Reorganisation Act, the Kingdom of Mysore gathered around itself in 1956 the districts of Kanara, Bijapur, Dharwar and the major portion of Belgaum district in the Gulbarga, Raichur and Bidar districts, from the princely State of Hyderabad, the South Kanara district (excluding Kasargod Taluk and Kollegal taluk in Coimbatore district) from the old Madras Presidency and the whole of the Part C State of Coorg.

Administration. The Legislature is made up of two houses, the Legislative Assembly of 224 members and the Legislative Council of 63 members.

The State is divided into 19 districts.

Districts

District	Area in (Sq.km)	Population	Head quarters
Bangalore	8005	4947610	Bangalore
Balgaum	13415	2980440	Balgaum
Bellary	9885	1489225	Bellary
Bijapur	17069	2401782	Bijapur
Bidar	5448	995691	Bidar
Chickmagalur	7201	911769	Chickmagalur
Chitradurga	10852	1777499	Chitradurga
Dakshina Kannada	8441	2376724	Mangalore
Dharwad	13738	2945487	Dharwar
Gulbarga	16224	2080643	Gulbarga
Hassan	6814	1357014	Hassan
Kodagu	4102	461888	Madikeri
Kolar	8223	1905492	Kolar
Mandya	4961	1418109	Mandya
Mysore	11954	2595900	Mysore
Raichur	14017	1783822	Raichur
Shimoga	10553	1656731	Shimoga
Tumkur	10598	1977854	Tumkur
Uttara Kannada	10291	1072034	Karwar

State of Economy. Karnataka is predominantly rural and agrarian. About 76 per cent of its population lives in rural areas while about 71 per cent of its working force is engaged in agriculture and allied activities which generate 49 per cent of the State income.

Among the food crops, Karnataka accounts for 47 per cent of the country's ragi production. The share of other crops in the country's production is: Jowar—16 per cent, small millets—10 per cent, tur—9 per cent, maize—7 per cent and rice and bajra—5 per cent each.

Among non-food crops, coffee is the most important as it accounts for 59 per cent of the country's coffee production. Other crops are: cardamom, arecanut, safflower, coconut, cotton, groundnut, chillies, castorseed, sugar-cane and tobacco.

There are a number of big industries. Machine tools, aircraft, electronic products, watches and telecommunication equipment are some of the items produced. Important Union Government undertakings engaged in the production of these items are Hindustan Aeronautics, Hindustan Machine Tools, Bharat Earth Movers, Bharat Electronics, Indian Telephone Industries and National Aeronautical Laboratory. The State-owned Viswesvaraya Iron & Steel Ltd., Bhadravathi, produces special steel and alloy steel.

Kudremukh Iron Ore Project is another major development project. Karnataka accounts for 85 per cent of the raw silk produced in the country. Apart from silk, its

sandal soap and sandal oil are well known in world markets.

Tourist Centres. Garden city of Bangalore has been adjudged the cleanest city in India more than once. A trip for Bangalore via Srirangapatnam, the capital of Tippu Sultan, to Mysore, the capital of Wodeyars is most rewarding.

Mysore city is famous for the Dussehra festival during September-October. The famous Kshnaraja Sagar dam and Vrindavan gardens are nearby.

Among the natural parks is Bandipur Wildlife Sanctuary, 80 km south of Mysore. Belur, on the bank of river Yagachi, was once the flourishing capital of Hoysala Empire. Sravanabelagola where the 17-metre statue of Gomateswara stands is a Jain pilgrim centre.

Governor: Ashok Nath Banerjee. **Chief Minister:** Rama Krishna Hegde. (Janata).

KERALA

Area: 38,863 sq. km.; **Capital:** Trivandrum; **Population:** 25,453,680; **Language:** Malayalam; **Literacy:** 69.17%.

Kerala is a small state, tucked away in the south west corner of India. It has an area of 38,863 sq. km. which represents only 1.18 per cent of the total area of India. But it supports a population of 25,453,680 which is 3.71 per cent of the total population of the country (1981). The disproportion between its area and population is reflected in the density—which in 1981 was 655 persons to the sq. km. This is the highest density among the States of the Union, higher densities being registered only by four Union Territories—Delhi-4178, Chandigarh-3948, Laccadive, Minicoy and Amindivi Islands, (now Lakshadweep)-1257 and Pondicherry-1228.

Physiography. Kerala may be divided into three geographical regions: (1) Highlands, (2) Midlands and (3) Lowlands. The Highlands slope down from the Western Ghats which rise to an average height of 3000 feet, with a number of peaks well over 6000 feet in height. This is the area of major plantations like tea, coffee, rubber, cardamom and other spices.

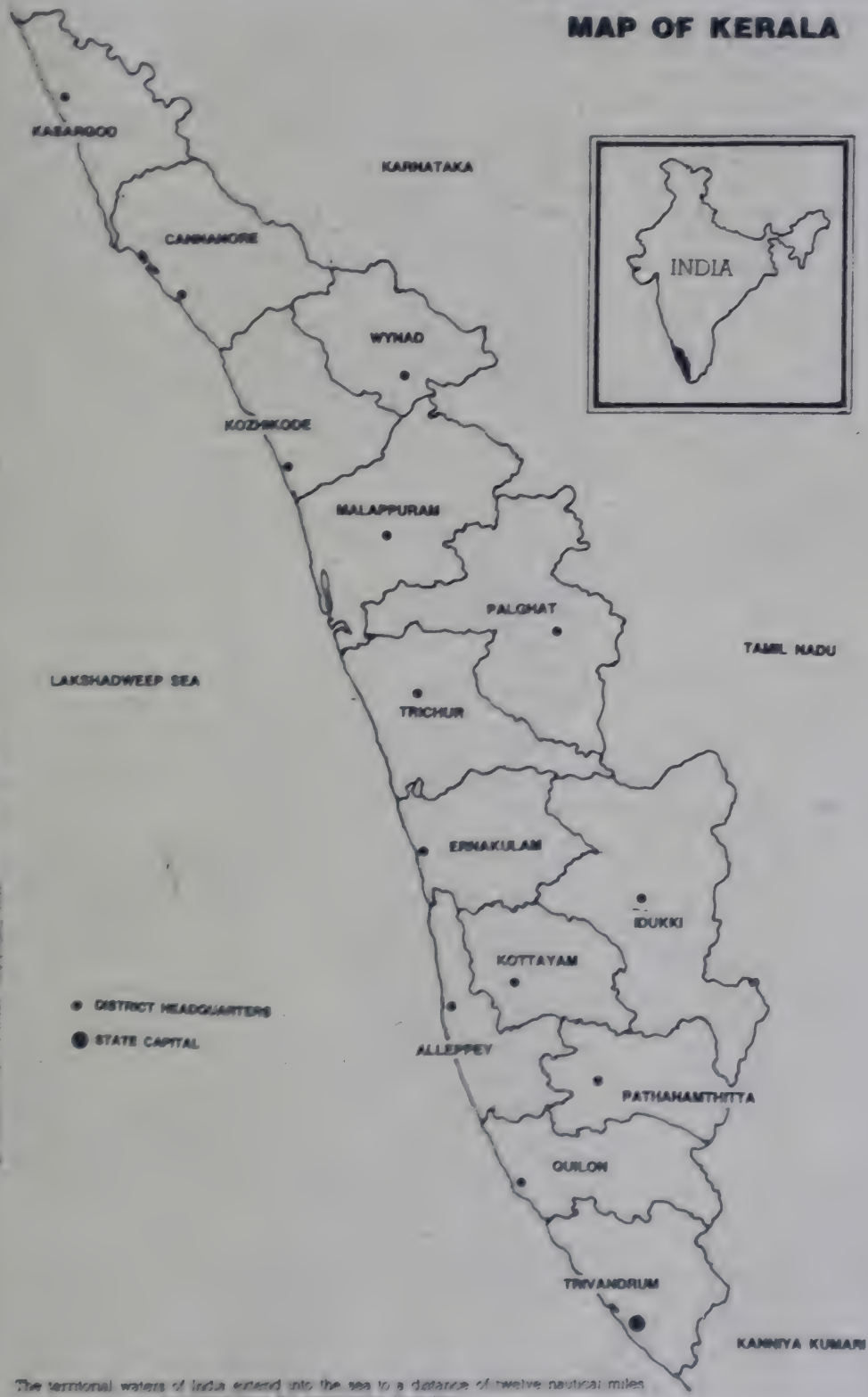
The Midlands, lying between the mountains and the Lowlands, is made up of undulating hills and valleys. This is an area of intensive cultivation. Coconuts, arecanuts, tapioca, bananas, rice, ginger, pepper, sugar-cane and vegetables of different varieties are grown in this area.

The Lowlands or the coastal area, which is made up of the river deltas, backwaters and the shore of the Arabian sea, is essentially a land of coconuts and rice. Fisheries and coir industry constitute the major industries of this area.

Kerala is a land of rivers and backwaters. Forty-four rivers (41 west-flowing and 3 east-flowing) cut across Kerala with their innumerable tributaries and branches, but these rivers are comparatively small and being entirely monsoon-fed, practically turn into rivulets in summer, especially in the upper areas.

The backwaters form a specially attractive and economically valuable feature of Kerala. They include lakes and ocean inlets which stretch irregularly along the coast. The biggest backwater is the Vembanad lake some 80 sq. miles in area, which opens out into the Arabian Sea at Cochin port. The Periyar,

MAP OF KERALA



Based upon Survey of India map with the permission of the Survey General of India
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The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line

Pamba, Manimala, Achenkovil, Meenachil and Moovattupuzha rivers drain into this lake. The other important backwaters are Veli, Katinamkulam Anjengo, Edava, Nadayara, Paravoor, Ashtamudi (Quilon), Kayamkulam, Kodungallore (Cranganore) and Chetuvu. The deltas of the rivers interlink the backwaters and provide excellent water communications in the low-lands of Kerala. A navigable canal, 228 miles long, stretches from Trivandrum, the capital of Kerala, to Tirur in the far north.

History. When India became free, Kerala was made up of two princely States, Travancore and Cochin, and Malabar which was under the direct administration of the British. One of the first steps taken by independent India was to amalgamate small states together so as to make them viable administrative units.

In pursuance of this policy the Travancore and Cochin States were integrated to form Travancore-Cochin State on 1st July, 1949. But Malabar remained as part of the Madras Province. Under the States Re-organisation

Act of 1956, Travancore-Cochin State and Malabar were united to form the State of Kerala on 1st November, 1956.

Some territorial adjustments had necessarily to be made on re-organisation. In this adjustment, Kerala lost to Madras (now Tamil Nadu) the taluks of Thovala, Agasteeswaram, Kalkulam and Vilavancode in the far south and Shencotta in the east, while it gained the Malabar district and the Kasargod taluk of South Kanara district in the north. The Laccadive, Minicoy and Amindivi islands lying off the coast of Malabar were detached from Kerala and declared as Union Territory.

Administration. The state has a unicameral legislature. The Legislative Assembly has 144 members.

The state is divided into 14 Districts.

Districts

Districts	Area	Population	Head-quarters
Trivandrum	2186.00	2,596,112	Trivandrum
Quilon	2687.50	2,192,901	Quilon
Alleppey	1360.58	1,865,580	Alleppey

Kerala: Highest and Lowest

Kerala claims the highest literacy rate, the highest sex ratio and the second lowest growth rate of population among the States in the country.

According to the final population figures of 1981 Census, Kerala's population is 2.54 crore, consisting of 1.25 crore males and 1.29 crore females. The decadal growth rate is 19.24 per cent, compared to 26.29 per cent in 1961-71. Tamil Nadu with 17.50 per cent claims the lowest growth rate in the country, while Nagaland has as high a rate as 50.05 and Assam 36.05.

Comparative figures of Kerala in the census since the formation of Kerala State:

	1961	1971	1981
Population Total:	16,903,715	21,347,375	25,453,680
Males:	8,361,927	10,587,851	12,527,767
Females:	8,541,788	10,759,524	12,925,913
Decadal population growth rate:	24.76	26.29	19.24
	(1951-61)	(1961-71)	(1971-81)
Density of population (persons per sq. km):	435	549	655
Sex ratio (females per 1000 males):	1022	1016	1032
Literacy rate Total:	56.85	60.42	70.42
Males:	54.97	66.62	75.26
Females:	38.90	54.31	65.73

Kerala's Seesaw Politics

Nov. 1, 1956: Birth of Kerala.
 Mar. 1957: First Assembly Election.
 April 5, 1957: E.M.S. ministry (Communist) sworn in.
 July 31, 1959: E.M.S. ministry dismissed.
 Feb. 1960, Election to the Assembly.
 Feb. 22, 1960: Pattom Thanu Pillai ministry sworn in (Congress).
 Sept. 25, 1962: (Pattom appointed Governor of Punjab).
 Sept. 26, 1962: R. Sankar ministry sworn in (Congress).
 Sept. 10, 1964: Sankar ministry goes.
 Mar. 1965: Assembly election (infructuous).
 Feb. 1967: Election to the Assembly.
 March 6, 1967: Second E.M.S. ministry sworn in (Communist).
 Oct. 24, 1969: E.M.S. ministry goes.
 Nov. 1, 1969: Achutha Menon ministry in (Left United Front).
 June 26, 1970: Assembly dissolved.
 Aug. 1, 1970: Achutha Menon ministry resigns.
 Sept. 1970: Assembly Election.
 Oct. 4, 1970: Second Achutha Menon

ministry in.
 Mar. 1977: Election to the Assembly.
 Mar. 25, 1977: Karunakaran ministry sworn in (Congress).
 April 25, 1977: Karunakaran resigns.
 April 27, 1977: A. K. Antony sworn in Chief Minister (Congress).
 Oct. 27, 1978: Antony resigns.
 Oct. 29, 1978: P. K. Vasudevan Nair ministry sworn in (Left United Front).
 Oct. 7, 1979: Vasudevan Nair goes.
 Oct. 11, 1979: C. H. Mohammed Koya ministry sworn in (Right United Front).
 Dec. 1, 1979: Mohammed Koya goes.
 Jan. 1980: Election to the Assembly.
 Jan. 25, 1980: E. K. Nayanar ministry sworn in (Left United Front).
 Oct. 20, 1981: Nayanar ministry goes.
 Dec. 28, 1981: Karunakaran ministry sworn in (United Democratic Front).
 Mar. 17, 1982: Karunakaran ministry resigns.
 May 19, 1982: Assembly Election.
 May 24, 1982: Karunakaran ministry sworn in (United Democratic Front).

Pathanamthitta	2518.98	1,107,658	Pathanamthitta
Kottayam	2195.50	1,697,442	Kottayam
Idukki	5149.62	969,292	Painav
Ernakulam	2358.19	2,535,294	Ernakulam
Trichur	2993.90	2,439,543	Trichur
Palaghat	4389.80	2,044,399	Palaghat
Malappuram	3632.30	2,402,701	Malappuram
Kozhikodu	2333.30	2,245,265	Kozhikodu
Waynad	2125.60	554,026	Waynad
Cannanore	2968.00	1,930,223	Cannanore
Kasargodu	1961.30	872,741	Kasargodu
Total	38860.57	25,453,680	

Source: Dept. of Economics and Statistics, Govt. of Kerala.

State of the Economy. Kerala with its high population presents complex problems in the sphere of food, employment and housing. The State is 50 per cent short of food. Owing to historical and climatic reasons the State has developed commercial agricul-

ture more than food crops. Consequently, the State is short of foodgrains, especially rice which is the staple food of the people.

Kerala has a unique cropping pattern. It accounts for 92 per cent of India's rubber, 70 per cent of cardamom, 70 per cent of coconut, 60 per cent of arecanut, 70 per cent of pepper, 80 per cent of tapioca and almost 100 per cent of lemon grass oil. Kerala is the single largest producer of a lot of other crops like bananas and ginger, besides tea and coffee in abundance.

While the State's economy continued to suffer from the adverse effect of the unprecedented drought of 1982 unprecedented rains and floods played havoc with her economy in 1984-85. With the assistance of the Govt. of India, the State Govt. mounted massive relief operation. Both production and productivity of almost all the major crops in the State suffered as a result of natural

disurbances, the crops most affected being coconut, cardamom, pepper and coffee.

However, agricultural production went up sharply in 1983-84 and is likely to increase modestly in 1984-85.

Rubber: Production increased from 152662 tonnes in 1982-83 to 162212 tonnes in 1983-84. Area of cultivation increased by 11,500 hectares over one year. The yield from one ha. increased from 828 kg to 868 kg.

Coffee: Coffee plantations in Kerala were devastated by the drought compared to coffee plantations elsewhere in the country where the effects of drought were less severe. In 1983-84 the production of coffee at all India level was 1.3 lakh tonnes of which Kerala's contribution was 15,375 tonnes consisting more than 22%. In 1983-84 India produced 1.40 lakh tonnes of which Kerala's share was only 9,465 tonnes contributing less than 17% of production.

Tea. Despite the severe drought and power cut tea production in Kerala improved from 44,092 tonnes in 1983 to 53,073 tonnes in 1984.

Cardamom. The production and yield of cardamom were severely affected by the prolonged drought of 1982-83. The drought is reported to have affected 30% of the Cardamom plantations. Hence cardamom production in Kerala declined to 1100 tonnes in 1983-84 from 1900 tonnes in 1982-83. The average productivity has also fallen by 31% in 1982-83.

In the industrial sector, the power cut imposed consequent to the drought in 1982-

83 continued to affect activities during the major part of 1983-84. However there was a growth of 9.69% in the number of working factories in 1983.

Work seekers in Kerala by educational level for the period ending 30-9-1984.

Placings through Employment Exchanges as on 30-9-1984—total No 8,719.

Tourist Centres. Under the aegis of the Department of Tourism and Kerala Tourism Development Corporation, many places in Kerala have been developed into tourist centres.

Trivandrum, the capital city had been once the cleanest city in India. It is an abode of temples, mosques and churches. Kovalam Beach Resort is 12 km from there. Neyyar Dam (19 km), Ponmudi (61 km) and Padmanabhapuram Palace (53 km) are other places of interest.

Periyar Wild Sanctuary at Thekkady in Idukki District is another attraction. Sabarimala, abode of Lord Ayyappan, is a famous pilgrim centre in Pathanamthitta Dist.

Cochin is one of the most beautiful places and grand sea-scape. Kalady in Ernakulam District is the birthplace of Sri Sankaracharya. Guruvayur in Trichur Dist. has the famous Lord Krishna shrine. Kalamandalam, the renowned Kathakali Centre is in Trichur Dist. Calicut is historically important as the capital of the Zamorins

Governor: P. Ramachandran. **Chief Minister:** K. Karunakaran (Congress).

MADHYA PRADESH

Area: 443446 Sq. Km.; **Capital:** Bhopal; **Population:** 5,21,78,844; **Language:** Hindi; **Literary:** 27.82%

Situated in the Centre of India and bounded on all sides by other Indian States, Madhya Pradesh (Central Province) is entirely justified in its name. It is the biggest State in India and was created on November 1, 1956 out of the former states, then known as Madhya Bharat, Vindhya Pradesh and Bhopal and 14 Mahakoshal districts of the old Central Province under the British.

Physiography: Except for the valleys of the Narmada and the Tapti, M.P. consists of a plateau with a mean elevation of 1600 ft. above sea level, interspersed with the mountains of the Vindhya and the Satpura ranges. The main river systems are the Chambal, Betwa, Sindh, Narmada, Tapti, Mahanadi and Indravati.

The average rainfall in the different regions of the State ranges from 30 to 60 inches. The climate is extreme in the north, temperate and breezy in the plateau and generally



District	Area (sq. km)	Popu- lation (1981 census)	Head- quarters
Balaghat	9229	1147810	Balaghat
Bastar	39114	1842854	Jagdalpur
Betul	10043	925387	Betul
Bhind	4459	973816	Bhind
Bhopal	2772	894739	Bhopal
Bilaspur	19897	2953366	Bilaspur
Chhatarpur	8687	886660	Chhatarpur
Chhindwara	11815	1233131	Chhindwara
Damoh	7306	721453	Damoh
Datia	2038	311893	Datia
Dewas	7020	795309	Dewas
Dhar	8153	1057469	Dhar
Durg	8537	1890467	Durg

East Nimar	10779	1153580	Khandwa
Guna	11065	1001985	Guna
Gwalior	5214	1107879	Gwalior
Indore	3898	1409473	Indore
Hoshangabad	10037	1003939	Hoshangabad
Jabalpur	10160	2198743	Jabalpur
Jhabua	6782	795168	Jhabua
Mandla	12269	1037394	Mandla
Mandsaur	9791	1263399	Mandsaur
Morena	11594	1303213	Morena
Narsinghpur	5133	650445	Narsinghpur
Panna	7135	539978	Panna
Raigarh	12924	1443197	Raigarh
Raipur	21258	3079476	Raipur
Raisen	8466	710542	Raisen
Rajgarh	6154	801384	Rajgarh
Rajnandgaon	11127	1167501	Rajnandgaon
Ratlam	4861	782729	Ratlam
Rewa	6134	1207583	Rewa
Sagar	10252	1323132	Sagar
Satna	7502	1153387	Satna
Sehore	6578	657381	Sehore
Seoni	8758	809713	Seoni
Shahdol	14028	1345125	Shahdol
Shajapur	6196	840247	Shajapur
Shivpuri	10278	865930	Shivpuri
Sidhi	10226	990467	Sidhi
Surguja	22337	1633476	Ambikapur
Tikamgarh	5048	736981	Tikamgarh
Ujjain	6091	1117002	Ujjain
Vidisha	7371	783098	Vidisha
West Nimar	13450	1630943	Khargone

State of Economy. The economy of Madhya Pradesh is primarily agriculture-based. Nearly 80 per cent of the population live in villages. Over 42.5 per cent of the land area is cultivable, of which 14 per cent is under irrigation. The Malwa region abounds in rich black cotton soil, the low lying areas of Gwalior, Bundelkhand, Baghelkhand and the Chhattisgarh plains have lighter soil, whereas the Narmada valley is formed of deep rich alluvial deposits. The main food crops are jowar, wheat and rice and coarse grains such as kondo, kutki, soma, etc. Important among

the commercial crops are oilseeds, cotton and sugarcane. The state is poised for a breakthrough in soyabean cultivation.

The major industries are the steel plant at Bhilai, Bharat Heavy Electricals at Bhopal, the Aluminium Plant at Korba, the Security Paper Mills at Hoshangabad, the Bank Note Press at Dewas, the Newsprint Mill at Nepanagar and Alkaloid Factory at Neemuch, Cement Factories, Vehicle Factory, Ordnance factory and Guncarriage Factory. There are also 23 textiles mills, 7 of them nationalised.

The Bhilai Steel Plant near Durg is one of the six major steel mills in India. A power station at Korba (Bilaspur) with a capacity of 420 MW serves Bhilai, the Aluminium Plant and the Korba Coalfields.

The Heavy Electricals Factory was set up by the Government of India at Bhopal during the Second Plan period. This is India's first heavy electrical equipment factory and also one of the largest of its type in Asia. It makes a variety of highly complicated equipment required for generation, transmission, distribution and utilization of electric power.

Tourist Centres. Khajuraho, once the capital of Chandella rulers is 595 km from Delhi of the embodiment of the great artistic activity of the 9th to the 12th centuries, only 22 temples out of 85 survive.

Ujjain with historic palaces, Sanchi with ancient Buddhist monuments, Bhopal the lake-side capital city, Jabalpur famous for marble rocks and Gwalior with beautiful forts are among the other tourist centres.

Kanha National Park near Jabalpur is one of the most beautiful wild life sanctuaries in India.

Governor: K.M. Chandy; **Chief Minister:** Motilal Vohra.

MAHARASHTRA

Area: 3,07,690 sq.km. **Capital:** Bombay;
Population: 6,27,84,171; **Language:**
Marathi; **Literacy:** 47.37%.

Maharashtra is the third largest state in India both in area and population. Only Uttar Pradesh and Bihar have larger populations and Madhya Pradesh and Rajasthan have larger areas than Maharashtra. The state is bounded by the Arabian Sea in the west,

Gujarat in the north west, MP in the north, AP in the south east and Karnataka and Goa in the south.

Physiography. The State of Maharashtra forms a huge irregular triangle with its base on the west coast of India, overlooking the Arabian Sea. The coastal strip, about 560 km long and not more than 80 km wide, is the Konkan, dotted with paddy fields and coco-

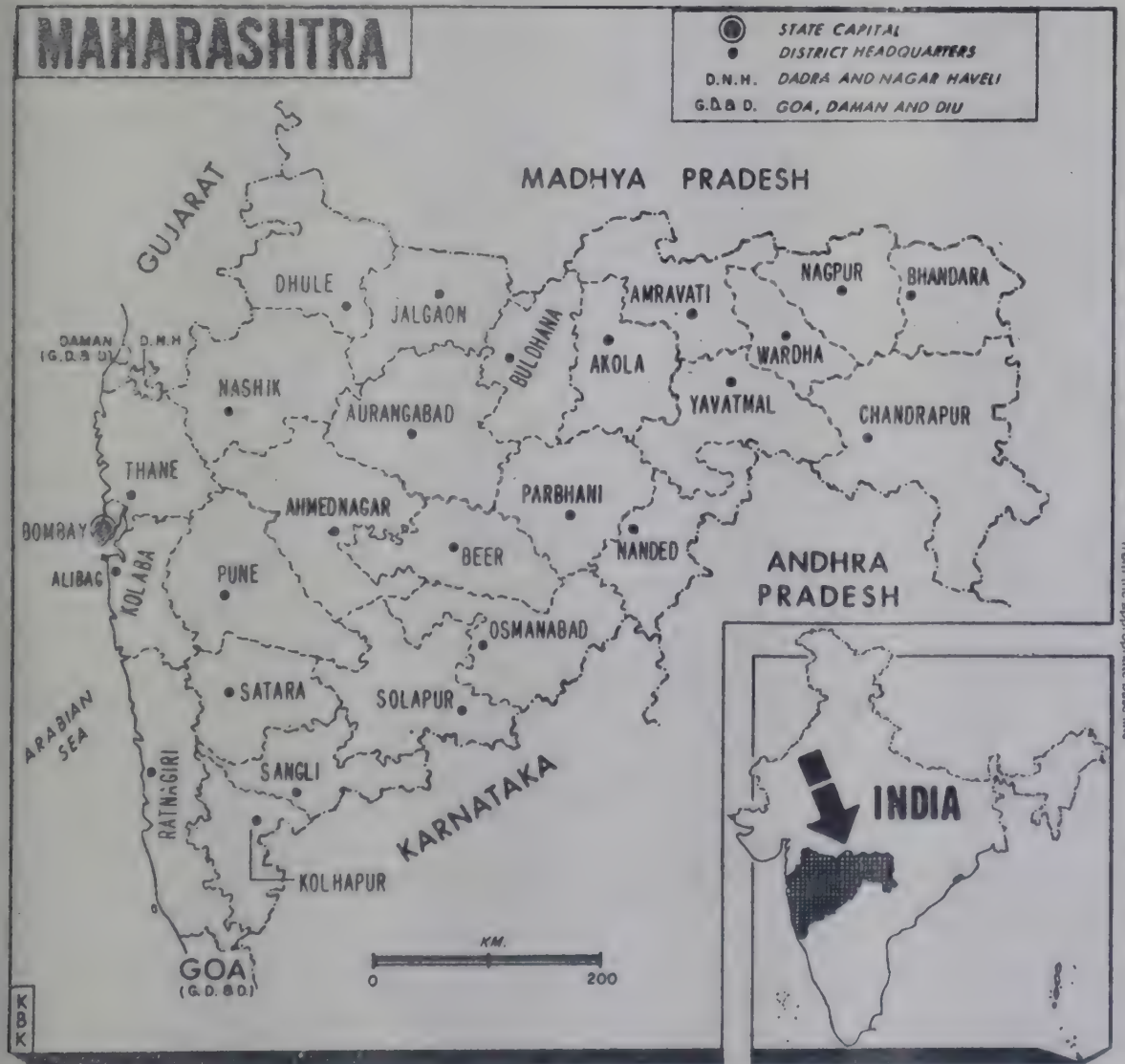
nut gardens. The Sahyadris or the Western Ghats running almost parallel to the sea coast flank the Konkan on its east. To the east of the Sahyadris stretches a vast plateau forming the apex of the triangle.

This plateau is drained by the great rivers Godavari, Bhima and Krishna, which rise in the Sahyadris and flow eastward across the Indian peninsula, into the Bay of Bengal. The plateau is extremely fertile and provides excellent crops of cotton, oil seeds and sugarcane. The rainfall in the state varies considerably, the areas west of the Sahyadris like the districts of Thane, Kolaba & Ratnagiri

receive heavy rains with an annual average of 200 cm.

The areas which lie in the rain-shadow of the Sahyadris, however, comprise the major portion of the state area and get an average rainfall of around 60 to 75 cm annually and in some areas less than 50 cm. These areas include the districts of Nashik, Pune, Ahmednagar, Dhule, Jalagaon, Satara, Sangli, Solapur and parts of Kolhapur.

History. Historically, Maharashtra falls into three regions. Western Maharashtra, Vidarbha and Marathwada. Among these,



The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line

Vidarbha has a hoary past and is mentioned many times in the Mahabharata. Maharashtra as a whole figures in history during the Mauryan period when it became part of the Mauryan Empire. After the fall of the Mauryas, Maharashtra was under the domination of a number of Hindu dynasties for nearly a thousand years. The Yadavas, the last of these dynasties, ended in 1294. Thereafter the state came under a succession of Muslim rulers.

With the rise of Shivaji, Maharashtra entered a new phase in history. Shivaji welded the Marathas into a powerful nation. They became rulers instead of subjects. The Peshwas who succeeded Shivaji built up a Maratha Empire which extended from Gwalior in the north to Tanjore in the south. The Maratha power received a setback at Panipat, in 1761, when the Afghan ruler Ahmed Shah Abdali routed the Maratha forces. They recovered only to confront the British power and to be decisively defeated in 1818. After the defeat of 1818 Maharashtra settled down as part of the Bombay Presidency under the British administration.

In independent India, Bombay continued as one state consisting of Maharashtra and Gujarat. This was an experiment in bilingualism—that is, one state comprising two linguistic units. The experiment did not work. Under the Bombay Re-organisation Act, 1960 Maharashtra and Gujarat were formed into separate States on May 1, 1960 Maharashtra retaining the old capital Bombay.

Administration. Legislature: The state has a bicameral legislature—the Legislative Assembly (Vidhan Sabha) and the Legislative Council (Vidhan Parishad). The state is divided into the following districts:

Districts

District	Population 1981	Area (in sq.km.)	Headquarters
Greater Bombay	8243405	603	Bombay
Thane	3351562	9558	Thane
Raigad	1486452	7148	Alibag
Ratnagiri†	1379655	8249	Ratnagiri
Sindhudurg*	772555	5219	Kudal
Nashik	2991739	15530	Nashik
Dhule	2050294	13150	Dhule
Jaigaon	2618274	11765	Jaigaon
Ahmednagar	2708309	17048	Ahmednagar
Pune	4164470	15642	Pune
Satara	2038677	10484	Satara

Sangli	1831212	8572	Sangli
Solapur	2610144	14874	Solapur
Kolhapur	2506330	7633	Kolhapur
Aurangabad‡	1588031	9172	Aurangabad
Jalna*	1032157	8656	Jalna
Parbhani	1829378	11038	Parbhani
Bid	1486030	10624	Bid
Nanded	1749334	10502	Nanded
Osmanabad+	1029712	7510	Osmanabad
Latur*	1293442	7304	Latur
Buldana	1508777	9661	Buldana
Akola	1826952	10575	Akola
Amaravati	1861410	12212	Amaravati
Yavatmal	1737423	13584	Yavatmal
Wardha	926618	6310	Wardha
Nagpur	2588811	9931	Nagpur
Bhandara	1837577	9213	Bhandara
Chandrapur**	1418306	10490	Chandrapur
Gandachiroli§	637336	15433	Chandrapur

* Provisional

† Reorganised as Ratnagiri and Sindhudurg district with effect from 1st May 1981.

‡ Reorganised as Aurangabad and Jalna districts with effect from 1st May 1981.

+ Reorganised as Osmanabad and Latur districts with effect from 16th August 1982.

** Reorganised as Chandrapur and Gandachiroli districts with effect from 26th August 1982.

§ Gandachiroli from 1st May 1983 onwards.

State of Economy. About 70 per cent of the people in Maharashtra depend on agriculture. About 12.22 per cent of the total cultivated area is irrigated. The principal food crops are wheat, rice, jowar, bajra and pulses. Important cash crops are cotton, sugarcane, groundnut and tobacco. The production of foodgrains in 1983-84 created a record of 109.5 lakh tonnes as compared to 92.16 lakh tonnes in 1982-83.

Although the state accounts for 9.4 per cent of the total population of the country, it shares about 12 per cent of industrial units, over 20 per cent of labour, about 16 per cent of investment and 25 per cent of the value of industrial output.

The industry groups contributing substantially to Maharashtra's industrial production are chemicals and chemical products, textiles, electrical and non-electrical machinery and petroleum and allied product; among food products sugar is the most important. Other important industries are pharmaceuticals, engineering goods, machine tools, steel and iron castings and plasticware. It also leads in sophisticated electronics equipment. Santa Cruz Electronics Export Processing Zone (SEEPZ), is a free trade zone for cent per cent export of

Electronic goods.

Tourist Centres. Some of the important tourist centres are Caves-Ajanta, Ellora, Elephanta, Kanheri, Karala; Hill stations-Mahabaleshwar, Matheran and Pan-

changi; Religious Places: Pandharpur, Nashik, Shirdi, Aundhanagnath, Nanded and Ganapatipule.

Governor: Kona Prabhakar Rao. **Chief Minister:** Patil Nilankekar (Congress)

MANIPUR

Area: 22,327 Sq. km; **Capital:** Imphal; **Population:** 14,20,963; **Languages:** Manipuri & English; **Literacy:** 41.52%

Manipur has been a Union Territory from 1956 and a full-fledged state from 1972.

Manipur is bounded by Nagaland in the north, Mizoram in the south, Upper Burma in the east and Cachar district of Assam in the west.

History. Formerly a state under the potential control of the Government of India, Manipur entered into interim arrangements with the Indian Union on August 15, 1947 and the political agency was abolished. The administration was taken over by the Government of India on October 15, 1949 under a merger agreement and it became centrally administered by the Government of India through a Chief Commissioner.

In 1950-51 an advisory form of Government was replaced by a Territorial Council of 33 elected and 2 nominated members. Later in 1963 a Legislative Assembly of 30 elected and 3 nominated members was established under the government of Union Territories Act, 1963. Because of the unstable party position in the Assembly, it had to be dissolved on October 16, 1969 and President's rule was introduced. The status of the administrator was raised from Chief Commissioner to Lieut. Governor with effect from Dec. 19, 1969.

On January 21, 1972 Manipur became a state and status of the administrator was changed from Lieut. Governor to Governor.

Manipuri and English are the official languages though several different dialects are spoken. Hindi is becoming gradually prevalent.

Administration. Manipur was reorganised into eight districts on 25-5-83. The area in sq. kms. and population (1981) census respectively of each district are as follows:

Districts

District	Area Sq.Km.	Population 1981
Imphal	1,295	5,56,146
Bishnupur	530	1,41,150
Thoubal	405	2,31,781
Ukhrul	4,400	82,946
Senapati	3,417	1,55,421
Tamenglong	4,344	62,289
Churachandpur	4,581	1,34,776
Chandel	3,375	56,444

State of Economy. The main crop of the state is paddy. Maize is cultivated in the foot hills. Out of the area of 22,327 sq. km., the area available for cultivation is about 2.1 lakh hectares only. The area under paddy is 1.86 lakh hectares out of which 1.10 lakh hectares in the valley. About 70% of the valley area is brought under high yielding varieties of paddy.

Manipur is leading the north eastern states in per hectare yield of rice and maize. The average yield of rice per hectare is 1675 kg. Manipur is the highest consumer of fertilizer — 38 kgs of nutrients per hectare—in the north eastern region.

More than 60% of the high yielding varieties of paddy area is brought under locally bred high yielding varieties of paddy like punshi, phouoibi and KD series.

The total annual plan 1983-84 allocation for industries as a whole was Rs.217 lakhs excluding Sericulture which shows an increase by 17% over the annual plan allocation of Rs.185 lakhs for 1982-83.

Handloom is the biggest industry in Manipur. The intensive Handloom Development Project has covered 5,000 individual weavers by the end of 1982-83.

Among the several large and medium industries in the various stages of establishment, are: a Khandasari Sugar Factory, a Spinning Mill with 23,000 spindle capacity at



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Loitangkhumou, mini-cement plants in each district of the state, a Starch and Glucose Factory at Nilakuthi Imphal West, a Sugar Factory and a Distillery Plant at Kabowakching (Bishnupur district) in association with the National Sugar Institute, Kanpur and a Paper Mill (bamboo-based) at Jiribam and another Paper Mill (pine-based) at Karong (Senapati District).

Sericulture: Manipur is the first to introduce Oak Tasar Industry. In the hill area there are 75 Tasar Farms. 1500 Tribal families (or 1500 numbers) produce about 30 million Tasar Cocoons valued at Rs.3.00 million. Apart from this over 100 Scheduled Caste families in the valley practise Mulberry rearing in traditional ways producing 45,000 kg of raw silk annually by reeling and spinning utilising the same in its exquisite Handloom Industry.

Tourist Centres. The important tourist centres in the state are Imphal, the capital and centre of all cultural and commercial activities adorned with two War Cemeteries maintained by Commonwealth War Graves Commission, Govindajee Temple, Women bazaar, etc. Besides, the Bishnu temple at Bishnupur built in 1467 A.D., the Loktak lake the biggest fresh water lake in eastern India, Keibul Lamjao, the only floating national park in the world, the Orchid Kard at Khongampat give unforgettable memory to the tourists.

Accommodation facilities at important centres such as Waichou, Kaina, Phubala, Sendra and Tourist Lodge at Imphal are remarkable. Transport facilities are provided with Deluxe, Mini Bus and Taxi services at moderate charges.

Governor: Gen. K. V. Krishna Rao **Chief Minister:** Rishang Keishing (Congress).

MEGHALAYA

Area: 22,429 sq.km; **Capital:** Shillong; **Population:** 13,35,819; **Languages:** Khasi, Garo and English. **Literacy:** 33.22%.

Meghalaya, literally 'the abode of the clouds' (Megha-clouds, Alaya-abode), was inaugurated as an autonomous unit on April 2, 1970. It was declared a State of the Indian Union of January 21, 1972.

Physiography. The exclusive tribal State of the Khasis, the Jaintias and the Garos is a mountain region. Shillong, the capital of Meghalaya, is situated in the centre of a high plateau. The highest peak in the state is the Shillong Peak 6450 ft. in height. Nokrek in the Garo Hills district is the next highest peak.

A number of rivers, none of them navigable, drain this mountainous area. Krishnai (Damring), Kalu (Jira), Bhugai (Bugi), Nitai (Dareng) and Someswari (Simsang)* flow through the Garo Hills District; Kynshi, Khri, Jmtrew, Umngot, Umiam Mawphlang and Umiam Khwan flow through Khasi Hills district, while Kupli, Myntdu & Myntang flow through Jaintia Hills district. All these rivers with rocky beds and swift currents abound in cataracts and waterfalls. The most picturesque waterfall is the one at Mawsmi called Vohsngthiang near Cherrapunjee. Here, the

waters of several rivulets are precipitated over a sheer cliff several hundred feet high.

The average annual rainfall of the state is 5829 millimeters. In the capital city of Shillong, rainfall averages 2455 millimetres per annum. The Cherrapunjee-Mawsynram belt in the southern slopes of Khasi Hills has the distinction of having the world's heaviest rainfall, with an average of 500 inches (12,700 millimetres) per annum.

Meghalaya, known as the Scotland of the East, is a country of surpassing scenic beauty. Waterfalls and mountains, lakes, rising peaks and billowing hills meadows, valleys and rushing rivers combine to make a rich panorama.

The Khasis, Jaintias and Garos are very ancient tribes, who had settled in these hills in remote times. They number about ten lakh.

Dance, music and sports reflect their way of life. Festive sounds of merry-making echo from hill to hill revealing the pulsating life of the tribal people. Mindful of their cultural heritage these simple folk are jovial and hospitable.

Administration. Meghalaya is a constituent state of the North Eastern Council. The State has a unicameral legislature. The

* The names in brackets are tribal names.

Legislative Assembly consists of 60 members—29 from Khasi Hills, 7 from Jaintia Hills and 24 from Garo Hills.

The following table shows the district-wise area and population of the State according to the final figures of 1981 census.

Districts

District	Area (sq. km)	Popula- tion	Headquarters
East Khasi Hills	5196	511414	Shillong
West Khasi Hills	5247	161576	Nongstoin
East Garo Hills	2603	136550	Jowai
West Garo Hills	5564	369877	Tura
Jaintia Hills	3819	156402	Williamnagar
Total	22429	1335819	

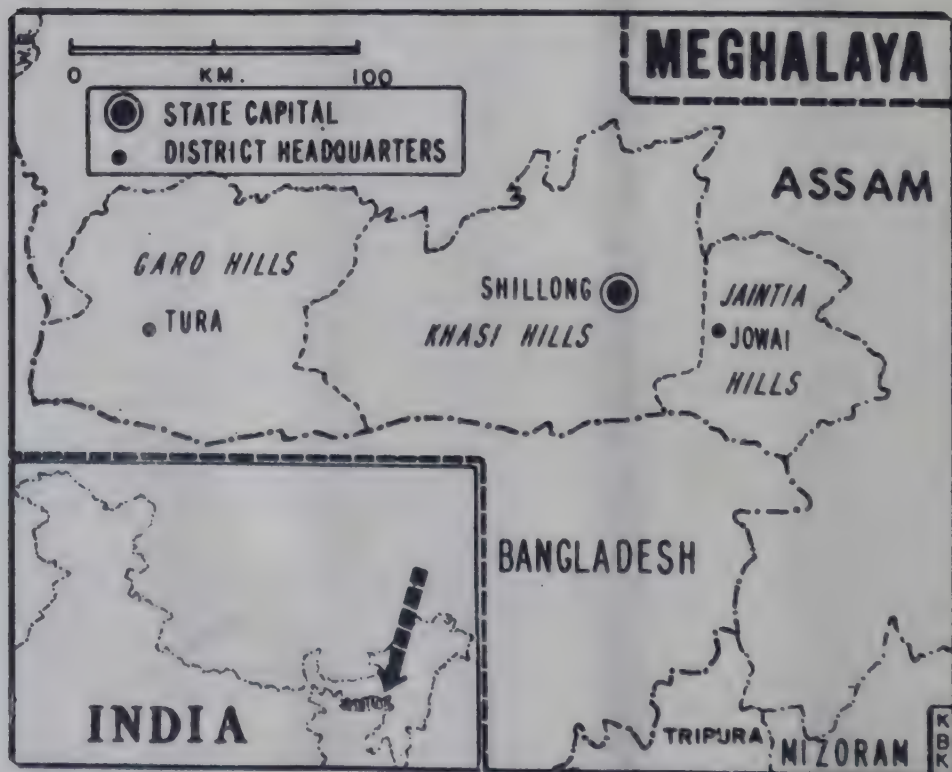
Meghalaya, originally, comprised two districts and three subdivisions. In order to accelerate the pace of development and to bring the administration closer to the people, the state has now been re-organised into five districts, and ten sub-divisions. For an all round development of the rural areas, the whole state is now covered by 30 Community

Development Blocks.

State of Economy. The majority of the people depend on land for their livelihood. But the potential for agricultural expansion is very limited in Meghalaya due to the terrain. Jhumming or shifting cultivation practised in the state on a large scale, is one of the biggest problems to be tackled in Meghalaya. This traditional practice is deeply rooted among the hill people.

However, the state government has made a modest beginning with a scheme to help the farmers to settle on lands which are suitable for steady cultivation. The state's Soil Conservation Department's Resettlement Scheme called Jhum Control Scheme envisages allotment of improved land to villagers together with supply of fertilizers, seeds, irrigation facilities, etc. The developed land would also be linked with roads for marketing the produce. At present, the villages in selected areas with a minimum of 50 families are growing crops by modern methods.

The state is not so far industrially developed.



The boundary of Meghalaya shown on this map is as interpreted from the North-Eastern Areas (Reorganisation) Act, 1971, but has yet to be verified.

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veloped. However, new industrial units set up by or with the help of the Meghalaya Industrial Development Corporation are fast coming up. Some of them are:

The Meghalaya Plywood Ltd., The Associated Beverages (P) Ltd., The Meghalaya Essential Oils and Chemicals Ltd., The Meghalaya Phyto-Chemicals Ltd.

The public sector cement factory at Cherapunjee known as the Mawmluh-Cherra Cements Ltd., which is producing 250 tonnes of cements daily, has been expanded to a production capacity of 930 tonnes per day.

Tourist Centres. Meghalaya is a 'dream-come-true' for the tourist. The charms of this land are many-splendoured and unique. It is a happy land of magnificent beauty, undulating hills, rolling grassland, cascading waterfalls, snaking rivers, terraced slopes and thrilling wild life.

Some of the important tourist spots are: (1) Uniam Lake by the side of the Shillong-Guahati road provides a most fascinating view. Fishing is a great sport over here. (2) Kyllang Rock, about 55 kilometres west of Shillong, is an interesting tourist spot. Rising out of the rolling grassy downs, it is an imposing dome of granite more than 700 feet in height. (3) Nohsngithiang falls at Mawsmi near Cherrapunjee, overlooking the hazy blue plains of Bangladesh, has an appeal unparalleled in the whole of India. And the Mawsmi caves are full of wonders to the eyes. (4) Nartiang, about 90 kilometres from Shillong, has a number of monoliths, the tallest being 27 feet high and ½ foot thick erected by the villagers of Nartiang between 1500 and 1835 A.D.

Governor: Bhishma Narayan Singh.

Chief Minister: Capt. Williamson Sangma (Congress).

NAGALAND

Area: 16,579 Sq.Km.; **Capital:** Kohima; **Population:** 7,74,930; **Languages:** English, Konyak, Angami, Sema and Lotha. **Literacy:** 41.99%

Physiography. The State of Nagaland is a narrow strip of mountainous territory between the Brahmaputra Valley of Assam and Burma. On the east it shares India's international boundary with Burma. On all other sides it is bounded by Indian territory—Manipur on the south, Assam on the west and north, and Arunachal Pradesh on the north east.

Excepting some areas in the foothills, the state is mountainous. Saramati, the highest peak, is 12600 ft. high and Kohima, the capital, is 4800 ft. above sea level. The main rivers that flow through the state are Dhanu, Doyang, Dikhu and Jhanji.

The population of Nagaland is almost entirely tribal. There are many separate tribes and sub-tribes among the Nagas with their own distinctive languages and cultural features. Kohima district is the home of the Angamis, Zeliangs, Rengmas and a small group of Kukis, Semas and other minor groups. Mokokchung is the home of Aos, Wokha district of the Lothas and Zunheboto district of the Semas. Tuensang district is the

home of the Chang, the Sangtam, the Khemnungan, the Yimchunger, the Phom, the Semas and other minor groups. Mon district is the home of the Konyaks. It is these people who chiefly practise Jhum cultivation.

History. The Nagaland State comprises the former Naga Hills district of Assam and the former Tuensang Frontier division of the North East Frontier Agency. These had been made a Centrally Administered Area in 1957, administered by the President through the Governor of Assam. In January 1961 the Government of India conferred the status of a State on Nagaland. The State of Nagaland was officially inaugurated on 1st Dec. 1963.

Administration. The State has a number of districts.

Districts			
District	Area (Sq.Km)	Population 1981	Headquarters
Kohima	4041	250105	Kohima
Phek	2026	70618	Phek
Mokokchung	1615	104193	Mokokchung
Zunheboto	1255	61161	Zunheboto
Wokha	1628	57583	Wokha
Tuensang	4228	152332	Tuensang
Mon	1786	73938	Mon
Total	16579	774930	

icameral legislature—the Legislative Assembly.

Originally the State was divided into 3 districts. In Dec. 1973, the districts were reconstituted as above.

State of Economy. Agriculture is the main occupation of 90% of the population. Rice is the important food grain.

Although agriculture is the mainstay of the state, only a little more than one-third of the total area is cultivable. Considering the hilly terrain, this is not unusual but the main drawback is that cultivation is vitiated by what is called jhumming. Under this system, forest lands are cut down and burnt and crops are planted in the burnt out lands. After a crop or two, these lands are abandoned and fresh forests are cut down and burnt. This leads to soil erosion and permanent loss of fertility to the soil.

But now the Govt. is encouraging terraced cultivation under various developmental programmes which are increasingly being adopted by people. The area under jhum cultivation is 87339 hectares and under terraced cultivation 62091 hectares.

Nagas have an artistic hand in many crafts. Carving of beautiful designs with their simple equipment like dao, homemade colours and pieces of bamboo is practised mostly for domestic and local requirements.

Nagaland has achieved remarkable progress in small and medium industries. Big industries are being planned although at

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present there is only 1 sugar mill, 1 pulp and paper mill and one plywood factory. One cement factory is also coming up.

Among the new industries are plastic moulding, hume pipes, polythene bags and rubber chappals.

Governor: Gen. K. V. Krishna Rao

Chief Minister: S. C. Jamir (Congress)

ORISSA

Area: 1,55,707 Sq.Km.; **Capital:** Bhubaneswar; **Population:** 2,63,70,271; **Language:** Oriya; **Literacy:** 34.12%

Physiography. Orissa lies on the east coast of India. It is surrounded by West Bengal in the north-east, Bihar in the north, Andhra Pradesh on the south-east, Madhya Pradesh on the west and Bay of Bengal on the east. The whole State lies in the tropical zone and is divided into four distinct tracts, viz, the northern plateau, the eastern ghats, the central tract and the coastal plains. The State is drained by three great rivers, the Mahanadi, the Brahmani and Baitarani and some lesser rivers, all of which flow into the

Bay of Bengal.

The biggest and the most famous lake in Orissa is the Chilka lake. Originally, it was part of the Bay of Bengal, but was subsequently closed up by sand dunes. It is 6 km long and 16 to 20 km wide. There are two beautiful islands in the lake named Parikud and Malud. Two other lakes call for mention, the Ansupa Lake (Cuttack District), about 5 km long and 1.6 km broad and the Sara Lake, (Puri District) about 1 km long and 3 km wide.

Orissa has an equable climate, neither too hot nor too cold. In some places however, extremes of climate are experienced, namely, in the western districts like

Bolangir, Sambalpur and Sundargarh. The average rainfall in the State is 150 cm. There is no desert or semi-desert area in the State.

History. Orissa, the land of the Oriyas, was known as Kalinga in the ancient days. In the third century B.C. (268 B.C.) Ashoka, the Mauryan emperor, sent a powerful force to conquer Kalinga which offered stubborn resistance. Kalinga was subdued after the carnage which followed struck Ashoka with remorse. It is here, where Ashoka "the Terrible" was transformed to Ashoka "the Compassionate". After the death of Ashoka, Kalinga regained its independence. In the second century B.C. Kalinga became a powerful country under its ruler Kharavela. With the death of Kharavela, Orissa passed into obscurity. In the 4th century A.D. Samudragupta set out on his conquest of the south from Magadha. He invaded Orissa, which lay astride his path and overcame the resistance offered by five of its kings. In A.D. 610, Orissa came under the sway of King Sasanka. After Sasanka's death Harsha conquered Orissa.

The country had its own independent dynasty of rulers (the Ganga dynasty) in the 7th Century A.D. In A.D. 795 Mahasivagupta Yayati the Second, came to the throne and with him began the most brilliant epoch in the history of Orissa. He united Kalinga, Kengoda, Utkala and Kosala in the imperial tradition of Kharavela. He is believed to have built the famous Jagannatha Temple at Puri. Under the kings of the Ganga dynasty, Orissa continued to flourish. Narasingha Dev of this dynasty is reputed to have built the unique temple of the Sun at Konarak.

From the 14th century, Orissa was ruled by successive Muslim Kings till 1592 when Akbar annexed it to the Mughal Empire. With the decline of the Mughals, the Marathas occupied Orissa. They continued to hold it till the British took over in 1803.

Orissa was made into a separate province in 1936. With independence, the princely States in and around Orissa, surrendered their sovereignty to the Government of India. By the States Merger (Governor's Provinces) Order 1949, the Orissa princely States were completely merged

with the State of Orissa on 19th August, 1949.

Administration. The legislature is unicameral—the Legislative Assembly consisting of 147 members.

The State is divided into 3 revenue divisions, Central, Northern and Southern and thirteen districts.

Districts

District	Area Sq.Km.	Population 1981	Headquarters
Baleshwar	6394	2252808	Baleshwar
Phulbani	11070	717282	Phulbani
Balangir	8903	1459113	Balangir
Cuttack	11211	4628800	Cuttack
Dhenkanal	10826	1582787	Dhenkanal
Ganjam	12527	2669899	Chhatrapur
Kalahandi	11835	1339192	Bhawani- patna
Kendujhar	8240	1114622	Kendujhar
Koraput	27020	2484005	Koraput
Mayurbhanj	10412	1581873	Baripada
Puri	10159	2921045	Puri
Sambalpur	17570	2280976	Sambalpur
Sundargarh	9675	1337871	Sundargarh
Total		26370271	

Orissa has a high percentage of Scheduled Castes and Tribes which together make 9.78 million out of a total of 26.37 million people.

State of Economy. Orissa's agro-based economy is always upset by some natural calamities like flood, drought, tornado or cyclone. Flood and drought are common to many States but only a few States are subject to cyclones and tornado. Orissa is one of the few. Cyclone has in recent years become a regular feature like flood or drought. In 1980 an unprecedented flood caused untold miseries to the people in nine districts of the state.

Over 76% of the people are dependent on agriculture. Out of the gross cropped area of 87.46 lakh hectares, 18.89 lakh hectares are irrigated. Rice, pulses, oil-seeds, jute, mesta, sugarcane, coconut and turmeric are important crops. The State contributes about one-tenth of the rice production in India.

Orissa's vast mineral, marine and forest resources provide adequate opportunities

for industries. Sixtysix large and medium industries are in operation since 1983. More than 9,000 small scale industries with an investment of Rs. 7,178.86 lakh with employment potential of 64,798 persons and 2,25,453 artisan based industries with an investment of Rs. 2,779.74 lakh providing employment to over 3,66,000 persons have been set up.

The Central Sector Projects are: Steel Plant at Rourkela, Sad Complex at Chhatrapur, Heavy Water Project at Talcher, Coach Repairing Workshop at Mancheswar, Aluminium Complex at Koraput, Captive Power Plant at Talcher, Aluminium Smelter at Talcher and Fertiliser Plant at Paradeep.

Tourist Centres. Bhubaneswar, the present capital of Orissa is known as the cathedral city of India on account of its numerous temples. A complete study of the "Kalinga Style" of architecture from its very inception to maturity spread over a period of about two thousand years is

epitomised in the monuments of Bhubaneswar. Places of interest are: Lingaraj Temple, Mukheswar Temple, Anant Basudeva Temple and Rajarani Temple the Jain and Buddhist Rock-cut caves of Khandagiri, Udayagiri and Dhuli together with Ashoka's rock edict.

Bhubaneswar is connected with Calcutta and Vizag by daily flights and New Delhi by triweekly Boeing flights. Also there are express trains to Delhi, Calcutta, Madras and Secunderabad and buses to Calcutta, Vizag, Raipur, Ranchi and Tata.

Puri (Jagannath Puri) is a coastal town and beach-resort in Orissa. It is 62 km from Bhubaneswar and is one of the four dhams (Holy places of pilgrimage) in India—the three others being Badri-Kedarnath in the north, Rameswaram in the south and Dwarka in the west. The presiding deities in the temple are Jagannath Balabhadra and Subhadra. Every year, in June-July (Asadha Sukla Dwitiya), thousands of devotees from all over India and abroad arrive at Puri.



participate in the Car-Festival.

Konark is about 65 km from Bhubaneswar and 85 km from Puri. It is famous for the great temple of the Sun-God, conceived as a giant celestial chariot with twenty-four exquisitely carved wheels,

drawn by seven impetuous horses. The temple is profusely sculptured with exquisite figures and figurines, fixed by an astonishing energy, trapped in stone.

Governor: B. N. Pandey; **Chief Minister:** J. B. Patnaik (Congress)

PUNJAB

Area: 50367 Sq. km; **Capital:** Chandigarh; **Population:** 16788915; **Language:** Punjabi; **Literacy:** 40.74%

Physiography. Punjab is bounded on the west by Pakistan, on the north by Jammu and Kashmir, on the north east by Himachal Pradesh and on the south by Haryana and Rajasthan. Physically, the state may be divided into two parts, sub-Shivalik strip and Sutlej-Ghaggar Plain. The sub-Shivalik strip covers the upper portion of Ropar, Hoshiarpur and Gurdaspur districts.

The Sutlej-Ghaggar Plain embraces the other districts of the Punjab. The land is highly fertile as they are formed by the tributaries of the Indus, Ravi, Beas, Sutlej and the river Ghaggar.

History. The word "Punjab" is made up of two Persian words 'Panj' and 'Aab', Panj means five and Aab means water. This name was probably given to this land of five rivers possibly in an era when this region came into close contact with Persia, prior to that period this region was known by different names at different times. Probably, when at the height of its glory it was known as Sapta Sindhu, the land of the seven rivers, namely Sindhu (Indus), Vitasta (Jehlum), Asuhi (Chenab), Purushin (Ravi), Vipasa (Beas), Satadru (Sutlej) and Saruni (Sarasvati). The last one is a dried up stream now and its traces, according to geologists, are found in the present seasonal streams that flow near Pehowa in Haryana. During the Greek occupation, the territory had shrunk into the area covering five rivers.

Punjab lies in the north west of India. Being in the way of invaders from the north, Punjab has had to take a lot of battle ring from the invaders. Punjab emerges into history with the coming of the Aryans into India. The Aryans in the early Vedic age apparently settled in the Punjab and its neighbourhood.

In 522 BC Darius of Persia conquered the territories round about the Punjab and made them a Satrapy of Persia. In 326 BC, Alexander the Great overran the Punjab. For a time, Macedonian governors controlled the Punjab but they were defeated by Chandragupta Maurya, who annexed the entire territory. With the decline of the Mauryan empire the Scythians occupied north west India and after them, the Parthians. The Kvshans came next. Thereafter the Punjab continued under indigenous rulers.

From the tenth century AD began a series of Muslim invasions culminating with Babar, the founder of the Mughal Empire. With the decline of the Mughal empire two other Muslim invaders crossed into India, Nadir Shah in 1738 and Ahmed Shah Abdali in 1748, 1750 and 1751, The Punjab had the worst of all these invasions.

The Sikh faith, which played a decisive role in the creation of a Punjabi-speaking state, came into being during a period of religious revival in the 15th and 16th centuries. It was founded as a new religious order by Guru Nanak. He was followed by nine Gurus. The subsequent 200 years witnessed the growth of Sikhism and its transformation into a militant organisation.

Guru Angad developed Gurumukhi script by combining the scripts current in north India at that time. Guru Ram Das laid the foundation of the city of Amritsar. Guru Arjun Dev compiled the Adi Granth. His son Guru Har Gobind started training his followers in the military art.

Punjab was annexed to British India by Lord Dalhousie in March, 1849. But the spirit of the Punjab remained unvanquished. Through the centuries Punjab became the sword arm of British India.

Punjab was constituted a separate province of India in 1937. With the partition of India, Punjab was divided between India and

Pakistan as East Punjab and West Punjab. On Nov. 1, 1956 the Princely States adjoining Punjab were formally absorbed into the Punjab State. On Nov. 1, 1956, Punjab was divided into three units—Punjab comprising the predominantly Punjabi-speaking areas, Haryana made up of the Hindi-speaking districts and Kharar tehsil and Chandigarh the Capital. Hilly areas were transferred to Himachal Pradesh.

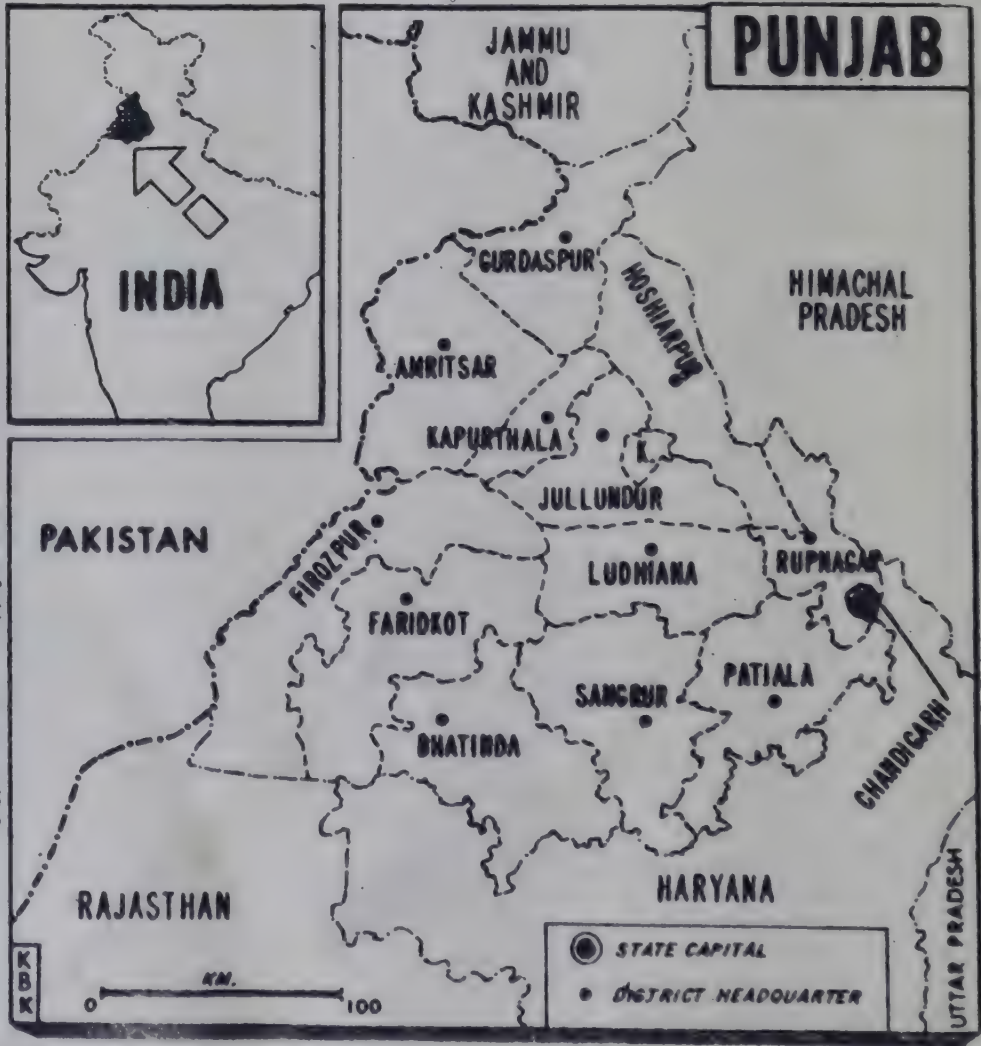
Administration. The Legislature is unicameral, the Legislative Assembly. The State is divided into 12 districts.

State of Economy. Punjab is primarily an agrarian state and agriculture occupies the most prominent place in Punjab's economy. About 70 percent of the people are engaged in agriculture. As against 51 per-

Districts

District	Area in Sq. km.	Popul- ation (1981)	Head- quarters
Amritsar	5087	2188490	Amritsar
Bhatinda	5551	1304606	Bhatinda
Faridkot	5740	1436228	Faridkot
Ferozepur	5874	1307804	Ferozepur
Gurdaspur	3562	1513435	Gurdaspur
Hoshiarpur	3881	1243807	Hoshiarpur
Jalandhar	3401	1734574	Jalandhar
Kapurthala	1633	545249	Kapurthala
Ludhiana	3857	1818912	Ludhiana
Patiala	4584	1568898	Patiala
Sangrur	5107	1410250	Sangrur
Ropar	2085	716662	Ropar

16788915



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cent all India average, it has 85 percent of its area under cultivation. Net area under cultivation is 84 percent as against the all India average of 42.65 percent. Compared to all other States, the fertilizer consumption in Punjab is the highest. The efforts of the State Government to provide irrigation facilities, cheap power and agriculture inputs at subsidised rates have acted as a catalyst of agriculture production. Total production of foodgrains rose from 147.77 m tonnes in 1983-84 to 154.50 m tonnes in 1984-85.

Agriculture production is now nearing the saturation point.

As many as 35455 small scale industrial units were set up during the period of three years 1982-83 to 1984-85 as compared to 11607 units set up during the corresponding period of 1977-78 to 1979-80, which is an increase of more than 3 times.

The chief manufactures are textiles, sewing machines, sports goods, sugar, starch,

fertilizers, bicycles, scientific instruments, electrical goods, machine tools and pine oil. Altogether there were 43794 industrial units employing about 188057 workers.

There were 100899 small scale units registered in the state upto 31-3-1985. These units employed 4,96,000 persons during 1984, produced goods valued at Rs.1625 crore.

Tourist Centres. Punjab is dotted with places of historical and cultural interest. Ropar, one of the centres of Indus Valley civilization, Amritsar, the city of the Golden Temple, sacred to the Sikhs, the ancient fort of Bhatinda, the architectural monuments of Kapurthala, the City of Gardens, Patiala and Chandigarh the capital designed by the French architect Le Corbusier are among the leading tourist attractions of the state.

Governor Shankar Dayal Sharma, **Chief Minister:** Surjit Singh Barnala (Akali Dal)

RAJASTHAN

Area: 342239 Sq. km.; **Capital:** Jaipur; **Population:** 3,42,61,862; **Languages:** Hindi and Rajasthani; **Literacy:** 24.05%

Rajasthan is one of the border States of India, sharing India's frontier with Pakistan on the West and Northwest. Punjab bounds it on the north, Haryana and Uttar Pradesh on the north-east and east, Madhya Pradesh on the south and south-east and Gujarat on the south-west.

Physiography. Rajasthan is one of the few states of India that show great contrast from one area to another. This disparity is noticeable in respect of climate, soil, vegetation, mineral resources, etc. However, the state may be divided into 6 regions. (1) Western arid region, (2) Semi-arid region, (3) South eastern region, (4) Chambal ravines, (5) Aravalli region and (6) Eastern region.

The Western arid region covers the whole of Jaisalmer district, north-western part of Jaisalmer and Jodhpur, South-east Bikaner, South western Churu and Western part of Nagaur. This region is characterised by typical desert conditions and forms the largest region in the state.

The semi-arid region lying west of the Aravalli ranges covers the districts of Jalore, Pali, south-eastern Jodhpur and Nagaur, Sikar, Jhunjhunu and north-eastern part of

Churu. The southern part of this area is watered by the Luni river while the northern part is an area of inferior drainage.

The Rajasthan canal (named as Indira Gandhi Canal) passes through the north-west portion of this region irrigating at present Ganganagar district and the north western part of Bikaner district.

The Aravalli region covers almost the whole of Udaipur, south eastern part of Pali and Sirohi and the western part of Dungarpur districts. The area is dominated by the mountains of the Aravalli range and outlying hills.

The eastern region comprises the districts of Jaipur, Ajmer, Sawai Madhopur, Bhilwara, Bundi, Alwar, Bharatpur and north-western part of Kota. It is mainly drained by Banas river and its tributaries. This region has the largest number of industries, located mainly at Jaipur, Ajmer, Kota, Bhilwara and Shahpura.

The south-eastern region embraces the districts of Banswara, Chittorgarh, Jhalawar and Kota. The Kota-Jhalawar area consists of stony uplands but the Chambal river and its tributaries have formed an alluvial basin in Kota.

The Chambal ravine region lies along the river Chambal, where it forms the boundary between Rajasthan and Madhya Pradesh.

History. The State of Rajasthan is an amalgam mainly made up of the old princely states of Rajasthan. It took some eight years for the state to come into its present shape. The first step towards the formation of this state was taken on March 17, 1948 with the formation of the Matsya Union, a Union of four princely states, Alwar, Bharatpur, Dholpur and Karauli. The second step came with the formation of Rajasthan, a Union of 9 States—Banswara, Bundi, Dungarpur, Jhalawar, Kishangarh, Kota, Pratapgarh, Shahpura and Tonk on March 25, 1948. The State of Udaipur joined this union on April 18, 1948, thus transforming the Union into the United States of Rajasthan.

The next two important steps were taken in 1949, the first on March 30, 1949 when the

four large states of Bikaner, Jaipur, Jaisalmer and Jodhpur joined the United States of Rajasthan and the second on April 25, 1949 when the Matsya Union joined up. The new union was known as the United States of Greater Rajasthan. The Union of Greater Rajasthan was further enlarged by the accession to it of the state of Sirohi on Jan. 25, 1950.

The final step was taken when the state of Ajmer, the tehsil of Abu and the area of Sunel Tuppa were integrated with Greater Rajasthan on Nov. 1, 1956, to be known simply as Rajasthan.

Administration. The legislature is unicameral—the Legislative Assembly. The State is divided into 27 districts, 84 subdivisions and 203 tehsils.



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Districts

District	Population 1981(Sq. km.)	Area in Sq. km.)	Head- quarters
Ajmer	1440366	8479	Ajmer
Alwar	1771173	8382	Alwar
Banswara	886600	5037	Banswara
Barmer	1118892	28387	Barmer
Bharatpur	1889132	8093	Bharatpur
Bhilwara	1310379	10450	Bhilwara
Bikaner	848749	27231	Bikaner
Bundi	586982	5550	Bundi
Chittorgarh	1232494	10858	Chittorgarh
Churu	1179466	16829	Churu
Dungarpur	682845	3770	Dungarpur
Ganganagar	2029968	20629	Ganganagar
Jaipur	3420574	14000	Jaipur
Jaisalmer	243082	38401	Jaisalmer
Jalore	903073	10640	Jalore
Jhalawar	784998	6216	Jhalawar
Jhunjhunu	1211583	5929	Jhunjhunu
Jodhpur	1667791	22860	Jodhpur
Kota	1559784	12437	Kota
Nagaur	1628669	17718	Nagaur
Pali	1274504	12391	Pali
S. Madhopur	1535870	10593	S. Madhopur
Sikar	1377245	7732	Sikar
Sirohi	542049	5135	Sirohi
Tonk	783635	7200	Tonk
Udaipur	2356959	17267	Udaipur
Dholpur	583156	3000	Dholpur

State of Economy. The principal crops are jowar, bajra, maize, wheat, grams, oil-seeds, cotton, sugarcane and tobacco. A deficit state in foodgrains in the pre-inde-

pendence years, the state achieved an all-time high in farm yield in 1967-68 (66 lakh tonnes). This abundance was followed by two years of want and unprecedented scarcity which shattered the economy of the state. The year 1970-71 proved to be a year of plenty with a production of 88.41 lakh tonnes, the highest recorded production for the state. The actual production of foodgrains for the year 1983-84 was 100.57 lakh tonnes.

Production target for kharif and rabi crops for 1984-85 has been fixed at 110.54 lakh tonnes. The estimated production is 81.07 tonnes.

Textiles, rugs and woollen goods, sugar, cement, glass, sodium, oxygen and acetylene units, pesticides, insecticides and dyes are some of the major industries. Other enterprises include the manufacture of caustic soda, calcium carbide, nylon tyre cord and copper smelting.

Rajasthan handicrafts are famous all over the world. Important handicrafts are marble work, woollen carpets, jewellery, embroidery, articles of leather, pottery and brass embossing.

Tourist Centres. Rajasthan has several sights to offer the tourist, especially in ancient and medieval architecture. Places of interest are Mount Abu, Ajmer, Alwar, Bharatpur, Bikaner, Jaipur, Jodhpur, Udaipur, Pali, Jaisalmer and Chittorgarh. In the year 1984-85 nearly 2.60 lakh foreign tourists and 33 lakh home tourists visited Rajasthan.

Governor: Vasantha Rao Patil; **Chief Minister:** Hardeo Joshi (Congress).

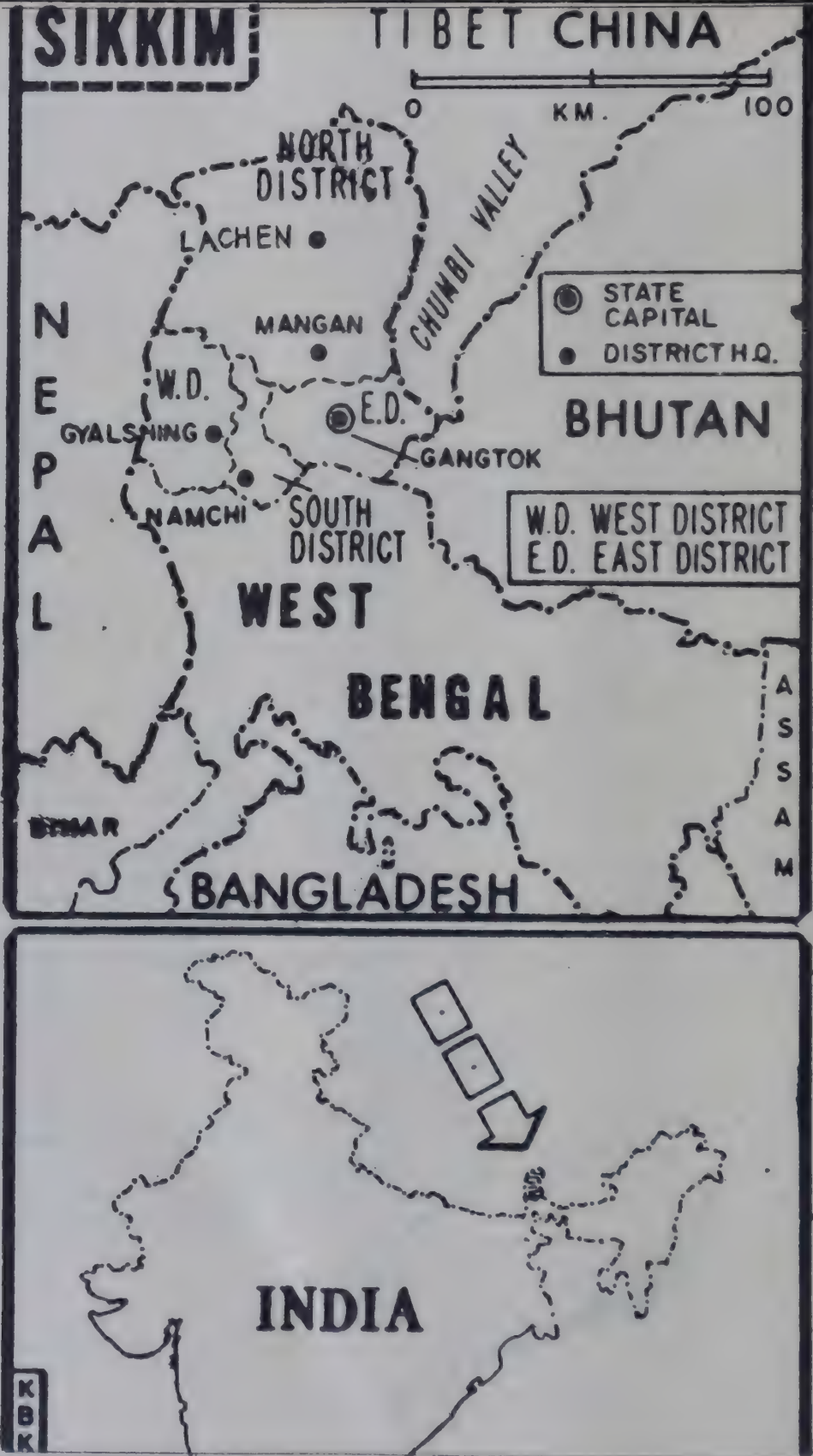
SIKKIM

Area: 7,096 sq. km.; **Cap:** Gangtok; **Population:** 3,16,385; **Languages:** Lepcha, Bhutia, Hindi, Nepali, Limbu; **Literacy:** 34%.

Sikkim, the 22nd State of the Indian Union, is a small mountain state in the eastern Himalayas. It is also the smallest state in India. It is bounded by Tibet on the north, Nepal on the west and Bhutan on the east. West Bengal lies to its south. It is the smallest as well as the least populous state in the Union. Sikkim is strategically important for India. It lies astride the shortest route from India to Tibet.

Sikkim became a State of the Indian Union under the Constitution (Thirty-eighth Amendment) Act, 1975, which came into force with retrospective effect from the 26th April, 1975, when the amending bill was originally passed by both Houses of Parliament.

Physiography. The State is entirely mountainous. About a third of the land is covered with dense forests, where sal, simbal, bamboo and other plants thrive. Some of the finest forests lie in the northern-most areas in Lachen and Lachung. Here the



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mountains rise to elevations of 7000 metres and more. Kanchenjunga (8579 m), the world's third highest peak, rises from this area. The forests here are inaccessible and remain for the most part unexploited.

On an average, Sikkim receives 125 cm. rain. But the rainfall varies widely between various regions like sheltered valleys, foothills and high mountains. River Tista and its tributaries drain the state. Tista is a perennial river being both rain-fed and snow-fed.

Sikkim boasts of several hundred different kinds of orchids and is frequently referred to as a botanist's paradise.

The population of Sikkim is mainly made up of the Lepchas, the Bhutias and their allied clans and the Nepalese.

The Lepchas, who are believed to have come from Assam were the first settlers in Sikkim. The Bhutias came from Tibet in the 14th century. The Tsongs are a minority community. In the 18th and 19th centuries the Nepalese came into Sikkim and established themselves. And, today, they form the majority community in the State.

Administration. The State has a unicameral legislature.

Sikkim is divided into four districts.

Districts

District	Area (sq. km.)	Population (1981)	Head- quarters
East	954	1,38,105	Gangtok
North	4,226	26,390	Mangan
South	750	75,691	Namchi
West	1,166	74,813	Gyalshing

State of Economy. The principal crops are maize, paddy, millet, wheat and barley. Orange and cardamom are the main cash crops. Other important crops are potatoes, apples and buck-wheat.

As the majority of the population depends on agriculture for livelihood, the Governments at both the Centre and the State have accorded high priority to agriculture. The Govt. has set up 9 regional centres and 7 sub-regional centres for agricultural development. A number of high yielding seeds suitable to local climatic conditions have been developed. The production of seeds in Government farms has increased from 1590

quintals in 1979-80 to 4266 quintals in 1983-84.

The foodgrains production has increased from 57,420 tonnes in 1979-80 to 84,000 tonnes in 1983. Campaigns for amendment of acidic soil and micro-nutrient application have also recorded significant progress.

The research complex of Indian Council for Agricultural Research, set up at Tadong, is doing useful research work.

Sikkim's tea estate at Temi and Kewzing extends over an area of 500 acres whose product is exported to USSR and West Germany. Coffee plantation has also been started at Majitar on an experimental basis with commendable results.

Sikkim as a whole has been declared industrially backward.

The main industrial units are the Food Preservation Factory at Singtam, Sikkim Tanneries Ltd. at Majitar, Sikkim Flour Mills at Tadong and Sikkim Distilleries at Rangpo and HMT watch assembly unit (Sikkim Time Corporation).

In 1982 Sikkim Time Corporation (SITCO) broke its own record by assembling 3.00 lakh watches. SITCO now proposes to manufacture a million watches every year in technical collaboration with HMT.

The Rs. 50-lakh Roller Flour Mill set up at Tadong has added an extruder food processing plant since 1983 to produce meals of higher nutritive value for school children under a programme sponsored by UNICEF.

Tourist Centres. Tourism in Sikkim has received a big boost in recent years. One of the most significant developments is the opening of the route from Pemayangtse to Yuksam and from Yuksam to Dzongri for domestic tourists. Rules and regulations governing grant of inner line permits to foreigners have been simplified.

Under a crash programme of creating more accommodation for tourists, a 78-bed tourist hotel at Gangtok and a 50-bed tourist lodge at Pemayangtse in West Sikkim have been constructed. Private hotels have been encouraged to expand hotel accommodation by arranging loans for them at low rates of interest.

With the opening of a Tourist Information Centre in Siliguri (West Bengal), tourists

have no longer to go to Darjeeling for getting permits for visiting Sikkim. Tourist Information Centres have been set up also in New Delhi and Calcutta.

The newly opened 'Blue Sheep' restaurant, at the Tourist Information Centre premises meets a long-felt need for a standard res-

taurant with Indian, Chinese and continental cuisines. One more restaurant-cum-lodge is proposed to be set up at Rumtek Dharma Chakra Centre.

Governor: T. V. Rajeshwar **Chief Minister:** N. B. Bhandari (Sikkim Sangram Parishad).

TAMIL NADU

Area: 130,058 sq. km.; **Capital:** Madras; **Population:** 48,408,077; **Language:** Tamil; **Literacy:** 45.78%.

Tamil Nadu is situated on the south eastern side of the Indian peninsula. It is bounded on the east by the Bay of Bengal, in the west by the Arabian Sea and the States of Kerala and Karnataka, in the north by Karnataka and Andhra Pradesh. It is the eleventh largest state in India and occupies 4 per cent of the country's total area.

Physiography. The land mass of the state can be divided into two natural divisions; (i) the eastern coastal plain and (ii) the hilly region along the north and the west. The coastal plain is usually sub-divided into (a) the Coromandel plain comprising the districts of Chingleput, South Arcot and North Arcot, (b) the alluvial plain of the Kaveri delta extending over Thanjavur and part of Tiruchirapalli districts and (c) the dry, southern plains in Madurai, Ramanathapuram, Kamaraj, Anna, Kanyakumari, Pudukkottai, Tirunelveli, and Tiruvarur Districts.

Along the whole length of the western part, at a distance from the sea varying from 80 to 160 km runs the range of the Western Ghats, a steep and rugged mass averaging 1220 metres above the sea level and rising to 2440 metres. The Palghat Gap about 25 km in width is the only marked break in the great mountain wall. To the south of this gap, the range is known as Anaimalai (Elephant Hills).

On the east are the Palni Hills on which is situated the famous hill station of Kodaikanal. The slopes of the Western Ghats are covered with heavy evergreen forests. These slopes are the sources of the rivers Kaveri, Vaigai and Tamaraparni. The Nilgiris and the Anaimalai are the hill groups with the maximum height.

In the famous Ootacamund area of the

Nilgiris District, the highest peak of Dodabetta is 2640 metres above the sea level. The so-called Eastern Ghats begin in Orissa and pass through Ganjam district of Orissa and run south west through all the districts lying between Ganjam and Nilgiris plateau.

The rivers of the state flows eastward from the western ghats and are entirely rain-fed. The perennial rivers are:- Palar, Cheyyar, Ponnaiyar, Kaveri, Meyar, Bhavani, Amaravati, Vaigai, Chittar and Tamaraparni. The non-perennial rivers are the Vellar, Noyil, Siruliar, Gundar, Vaipar, Valparai and Varshali. The 760-km-long Kaveri is the great river of the State. Rising on the Brahmagiri, a hill in Coorg in the Western Ghats, almost near the Arabian Sea, it travels the entire breadth of the peninsula and forms a large delta at its mouth in the Thanjavur District before flowing into the Bay of Bengal.

History. Tamil Nadu has a very ancient history that goes back some 6000 years. The State represents the nucleus of Dravidian culture in India, which antedated the Aryan culture in India by almost a thousand years. It is generally held that the architects of the Indus Valley Civilizations of the 4th millennium BC were Dravidians and that at a time anterior to the Aryans, they were spread over the whole of India. With the coming of the Aryans into North India, the Dravidians appear to have been pushed into the south, where they have remained confined. Tamil Nadu, with the other southern states, Andhra Pradesh, Karnataka and Kerala, today forms the repositories of the Dravidian Culture.

The Dravida country of which modern Tamil Nadu formed a part, was reputedly under three dynasties, Chola, Pandya and Chera from the 4th century BC. The Cholas occupied the present Thanjavur and Tiruchirapalli Districts and surrounding ter-

ritories and excelled in military exploits. In the 2nd century BC a Chola Prince, Elara, conquered Ceylon (Sri Lanka). The Pandyas excelled in trade and learning. They controlled the districts of Madurai and Tirunelveli and part of South Kerala. A Pandiyar King sent an embassy to the Roman Emperor Augustus in the first century BC. The Cheras were powerful on the West Coast in what is, today, Central and North Kerala.

The Pallavas of Kanchi rose to prominence in the 4th century AD and dominated the south for another 400 years. In the sixth century they overran the Chola dominions and carried their arms as far as Ceylon (Sri Lanka). The famous Alvars and Nayanars, sage-poets, flourished during the Pallava era. In the 9th century the last of the Pallavas was defeated by the Cholas who again became a great power in the south.

In the 13th century the Pandyas became dominant. Their Kingdom was a great centre of international trade. The rise of Vijayanagar spelt the decline of the Pandyas. They were ultimately defeated by Vijayanagar, and their territories were annexed to the Vijayanagar Empire. With the disintegration of the Vijayanagar Empire, Tamil Nadu was parcelled out among several petty kings.

The rise of the Muslim power in India has had its impact on Tamil Nadu, but by and large, Tamil Nadu remained unaffected by the political convulsions in north and central India. With the establishment of the East India Company at Madras in 1639, a new chapter was opened in the history of Tamil Nadu. Slowly but steadily, the whole of Tamil Nadu and most of South India came under British sway.

When India became free, the old Madras province, comprising Tamil Nadu and Andhra Pradesh and part of Kerala, continued as the State of Madras. But the agitation for a separate Andhra State compelled the Government of India to bifurcate the State into two separate States, Andhra Pradesh to include the Telugu-speaking areas and Madras, the Tamil speaking areas. The old capital Madras City was retained by the new Madras State.

Under the States Reorganisation Act 1956, Madras lost the Malabar District and the Kasargod taluk of S. Kanara District to the

newly formed State, Kerala, while Madras gained four taluks of the Trivandrum District and Shencotta taluk of the Quilon District from Kerala. The four taluks thus gained were constituted into a new district of Madras as the Kanyakumari District. The new Mysore State (Karnataka) absorbed some parts of the old S. Kanara District (excluding Kasargod taluk) and the Kollegal taluk of the Coimbatore District. In April 1960, 405 sq. miles of Chittoor District in Andhra Pradesh was transferred to Madras in exchange for 326 sq. miles from Chinglepattu and Salem Districts.

On Jan. 14, 1969, Madras State changed its name to Tamil Nadu. However, the capital city is still known by its old name, Madras.

Administration. The legislature consists of two houses - the Legislative Assembly and the Legislative Council.

The State is divided into 19 districts. The Madurai District has been bifurcated, viz., Madurai District and Anna District—raising the number of districts to 19.

Districts

District	Area (sq. km.)	Population 1981	Head- quarters
Chengalpattu	7920	3616508	Kancheepuram
Coimbatore	10873	3060184	Coimbatore
Dharmapuri	9643	1997060	Dharmapuri
Kanyakumari	1684	1423399	Nagercoil
Madras	128	3276622	Madras
Madurai	6558	2971489	Madurai
Anna	5836	156448	Dindigul
Nilgiris	2549	630169	Ootacamund
N. Arcot	12265	4414324	Vellore
Periyar	4800	2068462	Erode
Pudukkottai	4137	1156813	Pudukkottai
Ramanathapuram	4217	1021764	Ramanathapuram
Kamaraj	4175	1340907	Virudhunagar
Pon Muthuralamalingam	4186	972766	Sivagangai
Salem	8643	3441717	Salem
S. Arcot	10898	4201869	Cuddalore
Thiruchirappalli	11208	3612320	Thiruchirappalli
Thanjavur	8670	4063545	Thanjavur
Tirunelveli	11433	3573751	Tirunelveli
Total	130058	48408077	

State of Economy. Agriculture: Cereals dominate the agricultural sector.

rice being the main crop. Among cash crops, groundnut is the most important. The principal plantation crops are the tea and coffee.

Agricultural Production

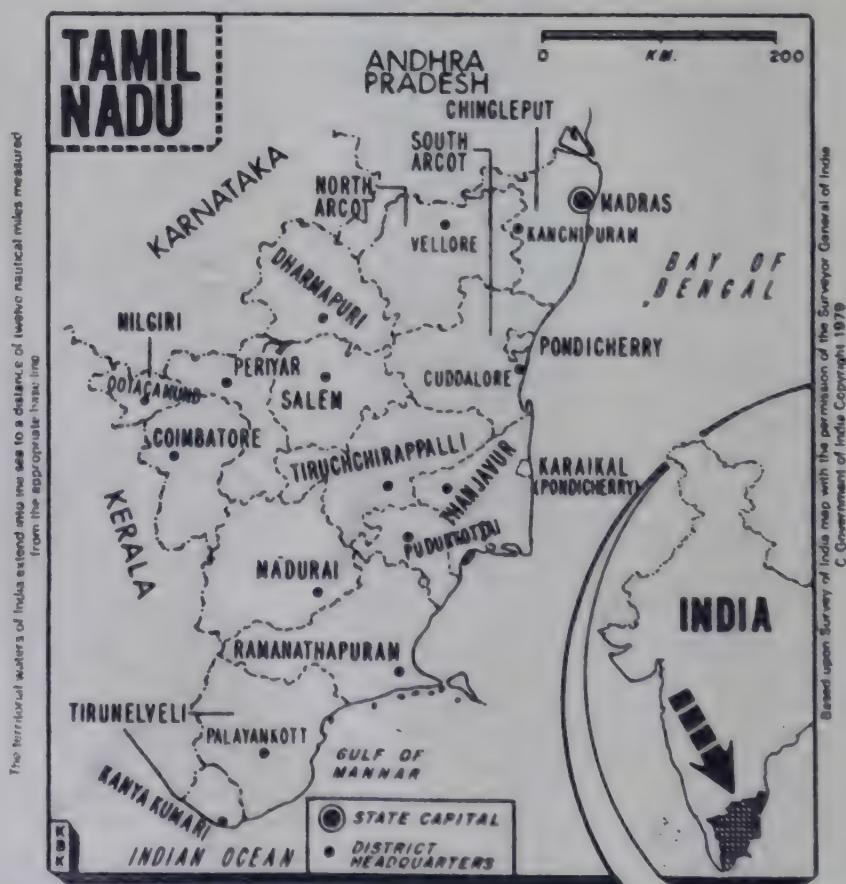
	Acreage lakh hec.		Production Lakh tonnes	
	82-83	83-84	82-83	83-84
	(Estimates only)			
Rice	19.74	22.82	36.42	54.42
Millets	14.61	16.33	10.92	14.75
Sugarcane	1.71	1.87	16.99	20.36
Pulses	4.94	8.06	1.89	3.45
Cotton	1.85	2.03	2.21	5.75
	(in bales)			
Oil seeds	14.42	8.25	12.74	7.52

There are about 4,700 village agricultural cooperative land development banks and there are 53 villages, 183 primary cooperative land development banks and there are 53.14 lakh agricultural families (in terms of operational holdings) in the State. About 83 per cent of these agricultural families have

been covered by cooperatives. 42.05 lakh families of small and marginal farmers. 81 per cent of these have been covered by cooperatives.

Registered small scale industries till August 1985 were 64,313. There were about 2,000 major and medium industries. The Industrial cooperative societies numbered 632 on 30-9-85.

Tamil Nadu ranks third in the country in securing financial credit from various financial institutions. The total industrial investment is high though no worthwhile central projects have been set up during the last two decades. Tamil Nadu accounts for 20 per cent of total production of Cement in India, 25 per cent of total spindlage, 25 per cent of automobile accessories and various parts. 11 Central Government units costing about 250 crore were installed before 1967. Two more central undertakings, BHEL Auxiliary unit at Ranipet and Cold-rolling unit at Salem for Stainless Steel have come up later. Of late, with the aid of the World Bank the Tamil



Nadu Government is starting a bagasse-based Newsprint Paper Industry with an investment of Rs. 200 crore.

The Tamil Nadu Industrial Development Corporation (TIDCO), State Industries Promotion Corporation of Tamil Nadu (SIPCOT) and TILC are the major Corporations set up to provide financial assistance and technical knowhow to large, medium and small scale industries. With the aid of these Corporations, industrial complexes called growth centres and industrial estates have been provided in different parts of Tamil Nadu, Hosur, Ranipet, Guindy, Ambattur, Karaikudi, Sivaganga, Paramakudi and Tiruchirappalli.

Tourist Centres. Tamil Nadu Tourism Development Corporation runs a chain of 17 hotels, 1 Beach Resort and 10 Youth Hostels.

It has also constructed Boat houses at Muthukkadu, Ooty, Pichavaram and Yercaud.

Hill Stations: Uthagamandalam (Ooty) Kodaikanal and Yercaud.

Religious Places: Suchindram, Rameswar, Tiruchendur, Madurai, Palani, Tiruchirappalli, Srirangam, Thanjavur, Kumbakonam, Nagore, Velankanni, Vaitheeswaran Koil Chidambaram, Tiruvannamalai, Kanchipuram, Tiruttani and Kanyakumari.

Tourist Centres: Mamallapuram, Poompuhar, Pitchawaram, Point Calimere, Courtallam, Hogenakkal, Anamalai Sanctuary, Mudumalai Sanctuary, Vedanthangal Bird Sanctuary, Kalakkad and Vandaloore Zoo and Mundathurai Sanctuary.

At Madras: Fort St. George, Fort Museum, Marina Beach, Snake Park, Guindy Park, Guindy Deer Sanctuary and Children's Park, Egmore Museum, Valluvarkottam Park, Crocodile and Vandaloore Zoo, Muthukkadu Boat House.

Governor: S. L. Khurana. **Chief Minister:** M. G. Ramachandran (AIADMK).

TRIPURA

Area: 10,486 sq. km; **Capital:** Agartala; **Population:** 2,053,058; **Languages:** Bengali, Tripuri, Kokborak and Manipuri; **Literacy:** 41.58%.

Tripura is the second smallest state in India. It was formally declared a Union Territory on November 1, 1957 and elevated to the status of a full-fledged State on January 21, 1972.

Physiography. Tripura is surrounded by Bangladesh on all sides, except for a narrow neck in the North-East, where it borders on Assam and Mizoram.

History. A Hindu State of great antiquity having been ruled by the Maharajas for 1,300 years before its accession to the Indian Union on October 15, 1949. With the reorganisation of States on Sept. 1, 1956 Tripura became a Union Territory. The Territory was made a State on January 21, 1972.

Administration. The Legislature has a single chamber—the Legislative Assembly. The jurisdiction of the Guwahati High Court extends over Tripura, with a bench functioning at Agartala.

Tripura is divided into three districts, 10 administrative sub-divisions, 177 tahsils and 5215 villages.

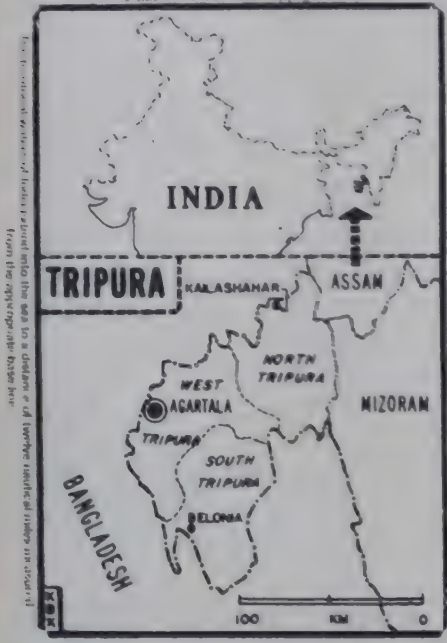
Districts

District	Area	Population
	(sq. km)	
North Tripura	3,541	5,41,248
West Tripura	3,359	9,76,252
South Tripura	3,577	5,35,558

State of Economy. About 54.5% of the land is under forest. Only about 24.3% area is available for agricultural use. The principal crops are paddy, wheat, jute, mesta, sugarcane, potato and oil seeds. Due to the acceptance of modern technology by the cultivators overall production of cereals increased about 19.9% in 1983-84 while 180,000 hectares were sown more than once as against 177,000 hectares in the previous year. Due emphasis is also being given for development of horticulture and cultivation of cash crops in the State.

Tea is a major industry in Tripura. There were 49 registered tea gardens covering an

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area of 5527 hectares and producing 45 lakh kg. of tea per year. This industry has been employing about 10,000 workers. Three Workers' Co-operative Societies have been formed for tea plantation. Tripura Tea Development Corporation, a Government of Tripura undertaking, has also started new plantation under the programme for bringing additional land under tea plantation in the state.

The jute mill set up in Agartala under the public sector produces about 15 tonnes of jute products per day and it employs about 2,000 persons.

The major small scale industries which have been functioning in the state are Aluminium Utensils, saw mill, steel furniture, carpentry, dry battery, pharmaceuticals, rice mill, washing soap, R.C.C. spun pipes, PVC

pipes, flour mill, aluminium conductors, leather goods, polythene pipe, plywood, fruit canning, candle, oil mills, etc. to name a few. A steel re-rolling mill with a capacity of about 6000 mt. of rolled steel products such as rods, bars and light angle iron is functioning under the private sector. Apart from that, brick kilns, pharmaceutical units, fruit processing units, wood treatment and seasoning units are also functioning under the public sector.

Handloom is the single largest industry in the state. Weaving is essentially a unbal household industry. In 1983-84 handloom products worth Rs. 9.75 crore were produced. Nine pilot centres are running in different parts of the state for imparting training in improved techniques and producing quality handloom goods. In 1983-84, the Tripura Handloom & Handicrafts Development Corporation has earned Rs. 2.05 crore by selling their products. In order to organise collective production and to streamline Government assistance, an Apex Weavers' Society has been established which is catering to the needs of about 50 Primary Weavers Co-operative Societies.

The sericulture industry in the State is developing fast. The area under cultivation of mulberry is about 1000 acres and production of cocoon is estimated to be 600 kg. per year. A design centre on handicrafts is functioning at Agartala. About 5000 craftsmen are now engaged in production of handicrafts (mainly cane and bamboo) products. The State produces handicrafts worth over Rs. 1 crore per year.

Tourist Centres. Important tourist centres are Nirmahal, Sipahijala, Dumbor Lake, Kamalasagar, Jampai Hill, Unakoti and Matabari.

Governor: Gen. K. V. Krishna Rao (Retd.).
Chief Minister: Nripen Chakraborty (CPI(M)).

UTTAR PRADESH

Area: 2,94,411 sq. km; **Capital:** Lucknow;
Population: 1,10,862,813, **Language:** Hindi,
Literacy: 27.38%.

Uttar Pradesh is the most populous state in India. In area, it ranks fourth, after M.P., Rajasthan and Maharashtra. It covers about 9 per cent of the total area of India.

Physiography. Uttar Pradesh is bounded by Tibet and Nepal in the north, Himachal Pradesh in the northwest, Haryana in the west, Rajasthan in the southwest, Madhya Pradesh in the south and southwest, and Bihar in the east.

Uttar Pradesh can be divided into three

distinct regions (i) northern mountains (ii) southern hills and plateau and (iii) the Ganga plain.

1. The lofty Himalayas embraces Uttar Kashi, Chamoli, Pithoragarh, Tehri-Garhwal, Garhwal and Almora districts. Nainital tehsil of Nainital district and Chakrata tehsil and a part of Dehra Dun tehsil of Dehra Dun district in the north, covering about one-sixth of the total area of the state.

2. This region covers almost the whole of Jhansi, Jalaun, Hamirpur and Banda districts, the Meja and Karchhana tehsils of Allahabad district, nearly the entire Mirzapur district, south of the Ganga river and the Chakna tehsil of Varanasi district. The altitude in this area does not generally exceed 300 metres above the mean sea level.

3. Between the Himalayas in the north and the hills and plateau in the south lies a vast homogeneous alluvial plain, one of the largest in the world. Because of the deep alluvium strata the region is almost devoid of minerals which partly accounts for the very insignificant industrial development of U.P. On the other hand its high fertility has led to heavy pressure of population on land.

The State has a tropical climate except for the Himalayan region which has a temperate climate.

The main rivers of the State from west to east are the Yamuna, Ganga, Ramganga, Gomati and the Ghaghara. All the rivers, except the Gomati, emerge from the Himalayas. The Yamuna and the Ganga flow from north-east to the south-west in their upper



mountainous courses, from the north to the south in western parts of the state and thereafter from the north-west to the south-east, joining at Allahabad.

History. Uttar Pradesh has a very ancient and colourful history. Although the state does not find mention in the Rig Veda, it is recognised in the later vedic age as Brahmarshi Desa or Madhya Desa. Many of the great sages of the Vedic times like Bharadwaja, Yajnavalkya, Vasishta, Viswamitra and Valmiki appear to have flourished in U.P. Many sacred books of the Aryans were also composed here. Varsha Purana, for example, is associated with Mathura.

The two great epics of India, the Ramayana and the Mahabharata, appear to have been inspired by U.P. The Ramayana features the royal family of Kosala and the Mahabharata centres round the royal family at Hastinapura, both in Uttar Pradesh.

In the 6th century BC, UP was associated with two new religions, Jainism and Buddhism. Mahavira, the founder of Jainism, is said to have breathed his last at Doora in U.P. It was at Saranath, again in U.P., that the great Buddha preached his first sermon and laid the foundations of his order. In the post-Buddhist period several centres in UP, like Ayodhya, Prayag, Varanasi and Mathura became reputed centres of learning. Sri Sankaracharya, the great Hindu reformer established one of his ashrams at Badrinath in U.P.

In the mediaeval period UP passed under Muslim rule and led the way to a new synthesis of Hindu and Islamic cultures. Ramananda and his Muslim disciple Kabir, Tulasidas and Birbal and many other intellectuals contributed to the growth of Hindi and Urdu. Urdu remains the perfect synthesis of Hindu and Muslim cultures.

Uttar Pradesh kept up its intellectual leadership under the British administration. The British combined Agra and Oudh into one province called the United Provinces of Agra and Oudh. The name was shortened to United Provinces in 1935. After independence in January, 1950, the United Province was renamed Uttar Pradesh.

Administration. The state has a bicameral legislature—the Legislative

Assembly and the Legislative Council.

The state is divided into 57 districts as under: Kanpur district was bifurcated into Kanpur (Urban) and Kanpur (Rural) districts with effect from April 23, 1981.

Districts

Districts	Area (sq. km.)	Population (1981 census)	Head- quarters
Agra	4,805	28,52,942	Agra
Aligarh	5,019	25,74,925	Aligarh
Allaha- bad	7,261	37,97,033	Allahabad
Almora	5,385	7,57,373	Almora
Azam- garh	5,740	35,44,130	Azamgarh
Bahraich	6,877	22,16,245	Bahraich
Ballia	3,189	19,45,376	Ballia
Banda	7,624	15,33,990	Banda
Bara-			Bara-
Banki	4,401	19,92,074	Banki
Bareilly	4,120	22,73,030	Bareilly
Basti	7,228	35,78,069	Basti
Bijnor	4,848	19,39,261	Bijnor
Budaun	5,168	19,71,946	Budaun
Buland- shahr	4,352	23,58,270	Buland- shahr
Chamoli	9,125	3,64,346	Chamoli
Dehra			Dehra
Dun	3,088	7,61,668	Dun
Deoria	5,445	34,96,564	Deoria
Etah	4,446	18,58,692	Etah
Etawah	4,326	17,42,651	Etawah
Faizabad	4,511	23,82,515	Faizabad
Farru- khabad	4,274	19,49,137	Fatehgarh
Fatehpur	4,152	15,72,421	Fatehpur
Garhwal	5,440	6,37,877	Pauri
Ghazipur	3,377	19,44,669	Ghazipur
Ghazia- bad	2,590	18,43,130	Ghaziabad
Gonda	7,352	28,34,562	Gonda
Gorakh- pur	6,272	37,95,701	Gorakhpur
Hamirpur	7,165	11,94,168	Hamirpur
Hardoi	5,986	22,74,929	Hardoi
Jalaun	4,565	9,86,238	Orai
Jaunpur	4,038	25,32,734	Jaunpur
Jhansi	5,024	11,37,031	Jhansi
Kanpur (Rural)	5,848	20,08,731	Kanpur
Kanpur (Urban)	337	17,33,492	Kanpur
Kheri	7,680	19,52,680	Kheri
Lalitpur	5,039	5,77,648	Lalitpur
Lucknow	2,528	20,14,574	Lucknow
Mainpuri	4,343	17,26,202	Mainpuri
Mathura	3,811	15,60,447	Mathura
Meerut	3,911	27,67,246	Meerut

Mirzapur	11,310	20,39,149	Mirzapur
Moradabad	5,967	31,49,406	Moradabad
Muzaffarnagar	4,176	22,74,487	Muzaffarnagar
Naini Tal	6,794	11,36,523	Naini Tal
Pilibhit	3,499	10,08,312	Pilibhit
Pithoragarh	8,856	4,89,267	Pithoragarh
Pratapgarh	3,717	18,01,049	Pratapgarh
Rae Bareli	4,609	18,86,940	Rae Bareli
Rampur	2,367	11,78,621	Rampur
Saharanpur	5,595	26,73,561	Saharanpur
Shahjahanpur	4,575	16,47,664	Shahjahanpur
Sitapur	5,743	23,37,284	Sitapur
Sultanpur	4,436	20,42,778	Sultanpur
Tehri-Garhwal	4,421	4,97,710	Narendra-nagar
Unnao	4,558	18,22,591	Unnao
Uttarkashi	8,016	1,90,948	Uttarkashi
Varanasi	5,091	37,01,006	Varanasi
Total	2,94,411	11,08,62,013	

State of Economy. U.P. is the largest producer of food-grains and oilseeds in the country. It leads all the states in India in the production of wheat, maize, barley, gram, sugarcane and potatoes.

Among food crops, wheat, rice, gram, maize and barley are important in the state. The production of wheat was 161.65 lakh tonnes during 1983-84, while barley touched the target of 8.82 lakh tonnes. All in all, U.P. produces about 20.6 per cent of the country's total foodgrains.

Among cash crops, production of rapeseed and mustard was more than 8.11 lakh tonnes. The state produces about one-half of the total sugarcane output in the country. During 1983-84, the production of sesamum was 78.4 thousand tonnes and linseed, 74.6 thousand tonnes in the state. During the year, the state produced 81.4 thousand bales of jute.

Until recently the organised industrial sector of U.P. was confined to agro-based industries such as sugar, cotton textiles, edible oils, miscellaneous food preparations, paper, etc. However, of late, electricity generation, railroad equipment, electrical

machinery, basic industrial chemicals, aluminium and cement factories have sprung up.

Sugar, cotton textiles and miscellaneous food preparations (mainly comprising edible oils including hydrogenated oils) are the three important industries in the large scale sector.

Till March, 1984, 4,053 industrial licences, letters of intent and DGTD registration were issued with an investment of Rs. 78,340 million.

Trial production in Kajrahat cement factory in Mirzapur district has already started. Auto tractors, Pratapgarh, have started commercial production of 'Pratap-284' model tractor.

In the small industries sector, 13,810 industries with an investment of Rs. 90 crore were set up during 1983-84 and employment was generated for more than 75,000 people in the small-scale sector.

Handloom industry meets nearly one-third of the total requirement of cloth in the state. During the year 1984-85, the production of handloom cloth was 600 million metres.

A sizing plant with an intake capacity of 0.58 million kilograms is being set up at Kashipur, costing Rs. 2.75 million. Five spinning mills, having a total of 25,000 spindles, are being set up, with an expenditure of Rs. 520 million. Besides, seven new co-operative spinning mills are being set up, involving an expenditure of Rs. 617 million. These units are likely to provide employment to 7,000 persons.

Tourist Centres. Uttar Pradesh has a treasure of rare scenic beauty spots, rich fauna and flora, ideal health resorts, high mountain peaks, fascinating rivers and captivating valleys.

The world-renowned Valley of Flowers, Yamunotri, Gangotri, Kedarnath, Badrinath, Hemkund, Pindari Glacier and hill resorts of rare charm, like Naini Tal and Mussoorie, Ranikhet and Almora attract ever increasing number of tourists. Places like Sravasti, Sarnath, Kushinagar, Sankisa and Kaushambi attract pilgrims both from within and outside the country.

Besides ancient places of pilgrimage like Varanasi, Naimisharanya, Prayag and Hardwar are also situated in the State. Places like Agra, Ayodhya, Sarnath, Varanasi, Lucknow,

Mathura and Prayag have rich treasures of Hindu and Islamic architecture.

Governor: Mohammad Usman Arif. **Chief Minister:** Vir Bahadur Singh (Congress).

WEST BENGAL

Area 88,752 sq.km; **Capital:** Calcutta; **Population:** 54580647; **Language:** Bengali; **Literacy:** 40.88%.

West Bengal covers the bottleneck of India in the east, stretching from the Himalayas in the north to the Bay of Bengal in the south. It is bounded on the north by Sikkim and Bhutan, on the east by Assam and Bangladesh, on the south by the Bay of Bengal and on the west by Orissa, Bihar and Nepal.

Physiography. West Bengal has two natural divisions, the Himalayan north comprising the districts of Darjeeling, Jalpaiguri and Cooch Behar and the alluvial plain that lies south of it. Darjeeling, the northernmost district has a maximum elevation of 3658 m above the sea level. The Jalpaiguri and Cooch Behar districts are low-lying areas watered by swift-flowing rivers like the Tista, the Torsa, the Jaldhaka and the Ranjit. The southern part is a thickly populated level expanse of rice fields, dotted with mango, cocount and banana gardens. This vast alluvial plain is the handiwork of many big rivers, the chief of which are the Bhagirathi and its tributaries—the Mayurakshi, the Damodar, the Kangsabati, and the Rupnarayan. The Bhagirathi, called Hooghly in its lower reaches, is itself a branch of the Ganga and provides Calcutta its link with the sea.

The entire state belongs of the high rainfall region. Rainfall varies from 120 cm in the south western region to 400 cm in the northern region. The normal rainfall for the state as a whole is around 175 cm.

History. The old Bengal (of which W. Bengal forms a part) known as Gauda or Vanga in ancient Sanskrit literature appears to have been celebrated from the epic period. The Mahabharata refers to the King of Vanga as an ally of the Kauravas in their war against the Pandavas. Apparently at the time of Aryan penetration into the east, Vanga had a well-settled civilization and culture.

In the 3rd century B.C Bengal was part of

the Mauryan Empire and from the 4th to the 6th centuries. A.D., it was under the Gupta dynasty. By about A.D. 800, Bengal had its own dynasty of independent kings, the Palas. The Palas were very powerful and expanded their territories into the neighbouring countries of Bihar, Orissa and Assam.

At the height of their power they had diplomatic relations with the Indonesian king Sri Vijaya. In the 11th century, Bengal passed under the rule of a new dynasty, the Senas. The Senas who ruled from their capital at Nadia were driven out by Qutbud Din, the Sultan of Delhi.

Bengal became a part of the Delhi Empire. With the death of Aurangzeb, the last of the great Mughals, Bengal became independent under its Muslim governors. Siraj Daula, the last independent Muslim ruler of Bengal, was defeated by the British at the battle of Plassey in 1757. For about seven years the British were in a sort of dual control with the successors of Siraj Daula, Mir Jaffar and Mir Kasim. In 1764 Mir Kasim was routed at the battle of Buxar and the British took over administration of Bengal.

When Bengal was first constituted by the British as a province it was a vast area, including present-day Bihar and Orissa and extended westwards upto Agra. In 1863 Agra was detached from Bengal but Assam was added to it. In 1874 Assam was formed into a separate province.

In 1905 Lord Curzon divided Bengal into two provinces. A new province called Assam and East Bengal with its capital at Dacca was carved out of old Bengal. The rest of the territory together with Bihar and part of Orissa formed Bengal. This event, known as the partition of Bengal, aroused the dormant patriotism of the Bengalis, who opposed the partition as an attempt at disintegrating Bengal. The rest of India stood by Bengal and troubles broke out.

Peace was restored in 1911, when the partition was abrogated by a declaration of King George V at the Royal Durbar in Delhi. Another change announced at the Durbar

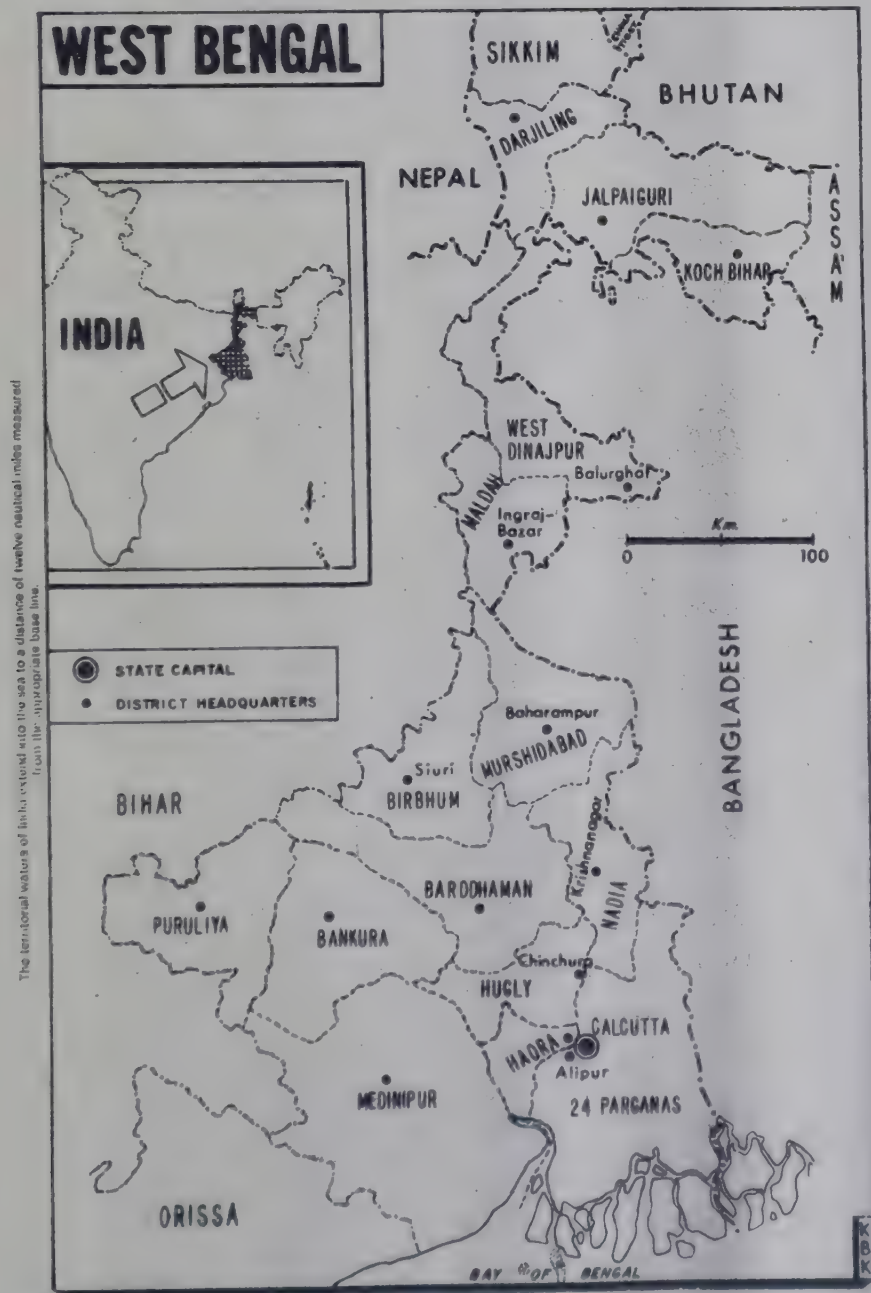
was the shifting of the capital from Calcutta to Delhi. The new Bengal did not include Assam or Bihar. It was a compact area of over 200,500 sq.km.

When India became independent in 1947, Bengal was partitioned between India and Pakistan. While Pakistan's share came to be called East Pakistan, India's share was called West Bengal. In 1950 the Princely State of Cooch Behar was merged into West Bengal.

The former French enclave of Chandranagore was added on Oct. 2, 1954. Under the States Reorganisation Act, some parts of Bihar were transferred to Bengal.

Administration. The legislature is unicameral—the Legislative Assembly. The State is divided into 16 districts.

The three-tiered panchayat system is with 3242 Gram Panchayats at base, 339 Panchayat Samities at the Community Block



Districts

District	Area in (sq. km)	Population	Headquarters
Bankura	6881	2374815	Bankura
Birbhum	4550	2095829	Suri
Bardhaman	7028	4835388	Burdwan
Calcutta	104	3305006	Calcutta
Cooch Behar	3386	1771643	Cooch Behar
Darjeeling	3075	1024269	Darjeeling
Hooghly	3145	3557306	Chinsurah
Howrah	1474	2966861	Howrah
Jalpaiguri	6245	2214871	Jalpaiguri
Malda	3713	2031871	English Bazar
Midnapore	14081	6742796	Midnapore
Murshidabad	5341	3697552	Berhampore
Nadia	3927	2964253	Krishnagore
Purulia	6259	1853802	Purulia
24-Parganas	14136	10739439	Alipore
W. Dinajpore	5206	2404947	Balurghat
Total		54580647	

(intermediate) level and 15 Zilla (district) Parishads at the apex. The last Panchayat election took place in May, 1983. Total number of seats at different levels stands at 55,495. The Panchayat institution acts as agencies for implementing development programmes.

State of Economy. West Bengal ranks second in rice production and fourth in national foodgrain production. Rice is one of the principal crops in West Bengal. It occupies 5,372.6 thousand hectares out of the total cultivated area of the State. The State alone accounts for 4.9% of the country's total foodgrain production (1981—82).

Among cash crops jute, mesta and tea dominate. West Bengal produces 55.0% of India's jute and mesta and 22.9% of tea and 19% of All-India production of potato is produced in West Bengal alone.

Oilseeds cover 359.8 thousand hectares of the area under principal crops and contribute 19.4% of All-India production. Home production only meets a fraction of the State's requirements. Much of this commodity is imported from nearby states.

The Left Front Government of West Bengal launched a special programme called "Operation Barga" for ensuring the rights of share-croppers through recording the name of Bargadars. The work of 'Operation Barga' is in progress along with normal settlement work. With the active help from the pan-

chayats the State Government could distribute 8.03 lakh acres of vested land upto March, 1985. About 15.96 lakh people received the land among which about 55 per cent belonged to the scheduled castes and scheduled tribes.

The production of coal in the State showed a little rise from 19,070 (p) (thousand tonnes) to 20,968.8 in 1981, 19823.9 in 1982 and lastly, 18,728.0 in 1983. This improvement could have been more if power supply to the Eastern Coal Ltd. (which covers most of the coal mines in West Bengal) had been better.

Tourist Centres. Calcutta, until 1912, was the capital of the Government of India. Now, of course, it is the commercial capital of the north-eastern States of India. It is the centre of the great industries like jute, tea, hides and skins, coal and lac. Places of interest are Victoria Memorial (Picture Gallery and Museum), Indian Museum, Zoological Gardens, the Jain Temple, the Kalighat Temple, Belvedere House (Originally the residence of British Viceroys when they visited Calcutta, now turned into the National Library), Raj Bhavan (Official residence of the State Governor), Marble Palace, Eden Gardens, Dalhousie Square (now renamed as the Binoy-Badal-Dinesh Bagh), Dakshineswar Temple and Howrah Bridge.

Darjeeling is on the Great Himalayan slope and is one of the famous hill stations of India. It is 592 km north to Calcutta. Places of interest are Government House, Town Hall, Museum, Observatory Hill, Botanical Gardens, Birch Hill Park, Tiger Hill, Senchal Lake and Ghoom Monastery.

Santiniketan (District: Birbhum), located at a distance of 145 km from Calcutta, is the seat of the famous Viswa Bharati University founded by the late Rabindranath Tagore.

Digha, most popular beach resort is in Midnapur district. It is 243 km from Calcutta and directly connected by road.

Sunderbans in South Calcutta near the Bay of Bengal is the largest delta forest in the world. This area, criss-crossed with thousands of canals, has abundance of materials of interest for the tourist and wild life enthusiasts.

Governor: Uma Shankar Dixit. **Chief Minister:** Jyoti Basu (CPM).

UNION TERRITORIES

1981 Census

Territory	Population	Density (per sq.km)	Sex Ratio**	Literacy (percentage)
Andaman & Nicobar Islands	188,741 (29)*	23 (28)*	760 (31)*	51.27 (8)*
Arunachal Pradesh	631,839 (24)	8 (30)	862 (26)	20.09 (29)‡
Chandigarh	451,610 (27)	3961 (2)	769 (30)	64.68 (2)
Dadra & Nagar Haveli	103,676 (30)	211 (14)	974 (9)	26.60 (26)
Delhi	6,220,406 (16)	4194 (1)	808 (29)	61.06 (3)
Goa, Daman & Diu	1,086,730 (22)	285 (12)	981 (5)	55.86 (5)
Lakshadweep	40,249 (31)	1258 (3)	975 (7)	54.72 (6)
Mizoram	493,757 (26)	23 (29)	919 (19)	59.50 (4)
Pondicherry	604,471 (25)	1229 (4)	985 (3)	54.23 (7)
All India	685,184,692	216	933	36.03

** Sex Ratio is the number of women per 1000 men. Only Kerala among States & Union Territories has 1034 women/1000 men. All others have below 1000 women/1000 men.

* Brackets indicates ranking among States & Territories.

‡ 29th is the last rank, because figures for Assam and J & K are not included.

ANDAMAN AND NICOBAR

Area: 8249 sq.km; **Capital:** Port Blair; **Population:** 188741; **Languages:** Bengali, Hindi, Nicobarese, Tamil & Malayalam. **Literacy:** 51.27%.

Andaman and Nicobar Islands are a group of more than 300 islands, the great majority of which (about 265) are uninhabited being too small and with little or no water. This group of islands in the Bay of Bengal may be considered the counterpart of the Lakshadweep Islands in the Arabian sea—both of them being the overseas possessions of the Indian Union.

Physiography. Andaman and Nicobar Islands are continental islands lying between 6 and 14 degree north latitude and 92 and 94 degree east longitude. They form two broad groups—Andamans and Nicobars which are separated by the 10 degree channel which is about 145 km wide and 400 fathoms deep. Geologically the islands appear to have been part of the land mass of south east Asia comprising north east India, Burma, Thailand, Malaysia and Indonesia.

It is thought that Andamans and Nicobars are the remnants of two vast mountain ranges which, at one time, stretched from Arrakan in

Burma (Cape Negrias) to Sumatra (Achin Head) in Indonesia.

Port Blair, the headquarters of the Islands, is 1255 km from Calcutta (by sea), 1191 km from Madras and 580 km from Rangoon.

The Andaman Group has, at the extreme north, Land Fall Island which is about 900 km away from the mouth of the Hooghly river and about 190 km from Burma. This Island is followed by the three main islands, North Andaman, Middle Andaman and South Andaman—all of them separated from each other by shallow seas. This area is known as Great Andaman. Further south, at a distance of about 100 km from Port Blair, lies Little Andaman Island. Besides these, there is a large number of other islands in the group, many of them very small in size.

The Nicobar Group lying south of the Andamans extends from 6° to 10° north latitude. The northernmost island is Car Nicobar which lies about 120 km to the south of Little Andaman and the southernmost island is Great Nicobar barely about 150 km from Sumatra. Pygmalion Point also known as Parsons Point which has since been re-named as "Indira Point" is the southernmost

tip of India and not "Kanyakumari" as is popularly known.

The important islands in this group are Great Nicobar, Car Nicobar, Chowra, Teresa, Nancowrie, Katchal and Little Nicobar.

The total area of the two groups of islands is 8249 sq.km of which Andamans with 6340 sq.km account for more than 76 per cent of the land area.

The total area of the Nicobar group of islands is 1953 sq.km, the length and width being about 260 km and 58 km respectively. In this group, the Great Nicobar has the largest area of about 1045 sq.km.

The climate of Andaman & Nicobar Islands is of the tropical type but the continuous breezes blowing in from the surrounding seas make it most pleasant.

History. The Andaman and Nicobar Islands, also known as the Bay Islands, had little historical importance till the advent of the European powers into India and the East

in the 16th century. The Portuguese who came first were not particularly interested in these islands but they were interested in the East Indies. The Dutch who came next drove the Portuguese from the East Indies and the Bay Islands naturally came into their domain. Meanwhile, the British who had established themselves in India came into conflict with the Dutch in and round the Andamans. It did not take long for the British to drive out the Dutch and occupy the islands.

The first settlement was established in North Andamans in the year 1789. Attempts at colonisation were ultimately given up but the penal settlement survived. The occasion came with the Revolt of 1857.

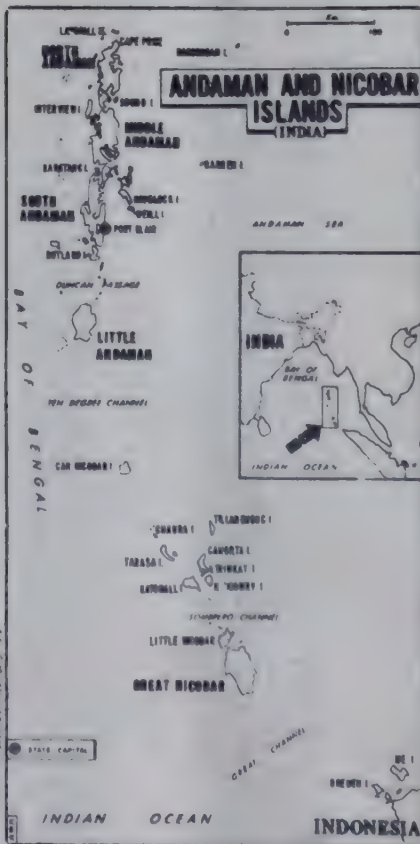
The British found that they had on their hands a large number of rebel convicts whom the Indian prisons of those days would hardly contain. The Andamans offered a ready-made solution. It is estimated that between 1858 and 1860 some 2000-4000 sepoy mutineers were sent to the Andamans. Many of them died under agonising circumstances.

With the British occupation of the Islands, contacts with the mainland of India grew. Many Indian traders, especially from the west coast of India, established themselves as traders in the islands. Christianity also spread.

The Cellular Jail. Meanwhile, a radical change occurred in the penal system in the Andamans. At first, the prisoners were confined in barracks for the night. This system was replaced by the Cellular Jail. Here, each prisoner was confined to a cell at night. The construction of the Cellular Jail was taken up in 1896. The construction itself was carried out by convicts. By 1897 four hundred cells were built. In 1906, all the 7 wings of the jail containing 663 cells were completed. The prisoners, who were deported to the Andamans, were all political prisoners of one sort or another.

The constitutional reforms of 1935 necessitated a thorough revision of policy. In Sept 1937, the first batch of prisoners left the Andamans and by Jan. 1938 all prisoners were released.

The Second World War and the consequent Japanese occupation of these islands from 1942-1945 brought the islanders a taste



The Tribals of Andaman

There are 6 primitive tribes in the Andaman and Nicobar Islands of which 4 belong to the Negrito stock viz. the Andamanese, the Onges, the Jarawas and the Sentinalese and 2 of the Mongoloid origin, viz., the Nicobarese and the Shompens. Of these, the Nicobarese and the Shompens live in the Nicobar District and the 4 other tribes are found in the Andaman District. The Nicobarese are a very thriving tribe and their population now is 22,000.

The Shompens are estimated to be more than 214. Of the primitive tribes, the Andamanese (28) and the Onges (97) are very friendly with the civilisation. Periodic contacts with the Jarawas are being made and the last such contact was made on the 30th October, 1985.

When the contact team led by the Lt. Governor, M.L. Kampani, visited them at Lakra Lungha in Foul Bay (Middle Andaman), a batch of 96 Jarawas including men, women and children were present to greet the Lt. Governor and the team. They are no longer hostile to the civilization although they are not very much inclined to accept the modern way of life.

Contact with the Sentinalese is also being made and the last such contact was made on 5th November, 1985. Through gestures, they seem to show signs that they are no longer hostile, as they have been painted to be.

The Administration has settled the Great Andamanese in Strait Island, a small area (6 sq.km) off the eastern coast of Middle Andaman. The Jarawas inhabit a reserved forest of about 648 sq.km. on the western coast of South and Middle Andaman.

The Sentinalese are the sole inhabitants of North Sentinal Island with an area of about 47 sq.km south west of Port Blair.

The Onges live in Little Andaman with an area of 751 sq.km. Until recently it was the exclusive home of the Onges, but now it has been opened up for settlement by others.

The Jarawas and the Sentinalese live in active isolation and are not so friendly disposed towards the outsiders. The problem the primitive tribes are facing is one of survival. While some of the primitive tribes have shown inclination to accept the modern way of life, others are yet to show them. However, there is a definite trend to indicate that they want to compromise with the civilisation for the sake of their own survival.

of foreign military occupation. After the evacuation of the Japanese in 1945, the islands, as part of India, became free on August, 15, 1947.

One beneficial result of the Japanese occupation was the expulsion of the Indian traders, who had ruthlessly exploited the ignorant islanders. They had either fled from the islands or were killed during Japanese occupation.

After independence, the Government of India was keen that mainland traders did not return to exploit the people and destroy their culture. The Andaman and Nicobar Islands (Protection of Aboriginal Tribes) Act was

passed in 1956, under which entry into tribal areas was prohibited and no outsider could carry on trade or industry in the islands, without the licence of the Administrator. Since, 1938 refugees and ex-servicemen were permitted and encouraged to settle down in the islands. Many of them have now become permanent settlers.

On November 1, 1956 the Andaman and Nicobar Islands were constituted into a Union Territory, administered by the President of India. The local administration is headed by a Lt. Governor from November 1982 onwards with his headquarters at Port Blair. In 1979 in response to a national

demand, the former Prime Minister Morarji Desai dedicated the Cellular Jail as a National Memorial.

Administration. The entire territory is delimited into 4 Sub Divisions and 7 tehsils as follows:—

Area, Sub Divisions, Tehsils

Sub Division	Tehsils in the Sub division	(in sq.km) Area
Mayabunder	1. Diglipur	884
	2. Mayabunder	1348
	3. Rangat	1098
South Andamar.	1. Port Blair	
	2. Ferrargunj	3010
Car Nicobar	1. Car Nicobar	129
Nancowrie	1. Nancowrie	1824

State of Economy. The principal crops of Andaman and Nicobar Islands are rice, coconuts and arecanut. But the unscientific cultivation of these crops calls for radical improvements. Other crops are sugar-cane, pulses, fruit and vegetables. Recently it has been found that the climate is suitable for spices and rubber. Both are being tried out on the islands on a large scale.

Industries comprise saw milling, oil milling, plywood and matches. A number of training-cum-production centres have been started by the government.

Tourist Centres. Old Cellular Jail which has been declared a national monument, Anthropological Museum, Mount Harriet.

Lt. Governor: Lt. Gen. (Rtd) T.S. Oberoi.

ARUNACHAL PRADESH

Area: 83,743 sq.km. **Capital:** Itanagar. **Population:** 6,31,839. **Languages:** Nissi, Adi, Wancho, Nocte, Bengali, English. **Literacy:** 20.9%.

Arunachal Pradesh (Land of Dawn-lit Mountains) is a thinly populated hilly tract on the north east boundary of India. It is bordered by Bhutan on the west, Tibet and China on the north, Burma on the east and Assam on the south.

Physiography. Arunachal is entirely mountainous except for thin strips of flat land most of which adjoin Assam. Dense forests cover more than two-thirds of the territory. The hydel potential is very high.

The population of Arunachal is predominantly tribal. All the tribes belong to Scheduled Tribes. According to the 1981 census, Scheduled Tribes formed 79 per cent of the population as against an average of 7 per cent for the whole of India. There are about 20 major tribes which are divided into a number of sub-tribes. The principal tribes are: Adi, Nishi, Apatani, Tagin, Mishmi, Khampti, Nocte, Wancho, Tangsha, Singpho, Monpa, Sherdukpen, Aka, etc. These tribes speak their own tongues. These tribal people are colourful and hospitable and fond of music and dance.

History. Arunachal, originally known as the North East Frontier Agency (NEFA) was placed under the administration of the Union Government in 1949. It was declared a Union Territory under the name of Arunachal Pradesh on January 20, 1972.

Administration. On 15th August 1975, the Pradesh Council of Arunachal Pradesh was converted into a Legislative Assembly. A Council of Ministers was also constituted.

The territory is divided into 10 districts.

Districts

District	Population (1981 census)	Area (Sq.Km.)	Head quarters
West Kameng	63,302	9,594	Bomdila
East Kameng	42,736	4,134	Seppa
Lower Subansiri	1,12,680	13,010	Ziro
Upper Subansiri	39,410	7,032	Daporijo
West Siang	74,164	12,006	Along
East Siang	70,451	6,512	Pasighat
Dibang Valley	30,978	13,029	Anini
Lohit	69,498	11,402	Tezu
Tirap	1,28,650	7,024	Khonsa
Tawang	NA	NA	Tawang
Total	6,31,839	83,743	



each under a Deputy-Commissioner. Itanagar is the capital of the territory and is in Lower Subansiri district. The Union Territory is administered by a Lt. Governor.

State of Economy. Nearly 46 per cent of the population of Arunachal Pradesh is engaged in agriculture. Irrigated area forms 26 per cent of the total cultivated area of about 1,33,430 hectares. The traditional method of agriculture is Jhumming, a kind of shifting cultivation. The forests are cleared and crops are raised for one to three years, depending on the fertility of the soil. Thereafter the cultivators move on elsewhere. A determined effort is being made to wean the people from Jhumming. A total area of 56,270 hectares of land have been brought under permanent cultivation. The main crops are rice, maize, millet, wheat and mustard.

About 61,000 sq.km of the territory is covered by the forest, which has become the

important source of revenue of the territory.

The territory has a bright prospect of forest-based industries. A remarkable number of medium and small scale industries including saw mills, plywood and veneer mills, rice mills, fruit preservation units, oil expellers, besides handloom and handicraft industries have been established. The territory has 1086 units of small scale and 12 units of medium scale industries. A cement plant with a capacity of 30 tonnes per day and drilling of crude oil have been in progress. A paper mill with a capacity of 100 tonnes per day is also to be set up very soon.

Tourist Centres: Capital city of Itanagar with remnants of the Itafort, ancient Buddhist Monastery near Tawang, archaeological centres of Malinitan, Dismac Nagar are tourist interest.

Lt. Governor: T.V. Rajeshwar

Chief Minister: Gegong Apang

CHANDIGARH

Chandigarh which has been a Union Territory since 1966 is becoming part of Punjab state according to the Punjab Agreement. It was the capital city of both Punjab and Haryana where the High Court and University

for both states were located. A planned modern city, it was designed by the French architect Le Corbusier.

In 1981 census Chandigarh showed a population of 451610. Its area is 114 sq.km.

DADRA AND NAGAR HAVELI

Area: 491 sq.km; **Capital:** Silvassa; **Population:** 1,03,676; **Language:** Bhili, Bhilodi, Gujarati and Hindi. **Literacy:** 26.60%.

Dadra and Nagar Haveli lies near the West Coast surrounded by the states of Gujarat and Maharashtra. It consists of two pockets namely Dadra and Nagar Haveli and these two pockets are intercepted by the territory of Gujarat.

History. The territories of Dadra and Nagar Haveli were originally assigned to the Portuguese by the Maratha government in 1779 for an aggregated revenue of Rs. 12,000/- in return for their friendship. The Portuguese ruled this territory till its liberation in 1954. After liberation, the administration was carried on by an Administrator chosen by the people themselves.

Probably this is the only part of the country which was ruled by the people themselves for about 8 years (1954 to 1961). On the 11th

August, 1961, the territory was integrated into the Indian Union.

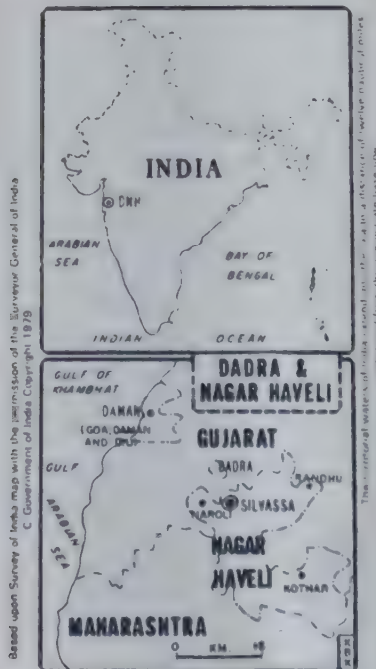
Administration. The territory is under the control of an Administrator. The first group Panchayats at the village level was established in 1968 and thereafter elections are being held regularly every four years.

State of Economy. Agriculture is the principal occupation of adivasis who represent 79 per cent of the total population as per 1981 Census. Paddy, ragi, pulses and fruits are the major crops while wheat, vegetables and sugarcane are also cultivated. About 22,800 hectares of land are under cultivation. The Department of Agriculture has taken up several schemes to explore the production potential of this area. Area under high yielding varieties has increased from 5951 hectares in 1983-84 to 6715 hectares during 1984-85. A number of new commercial crop varieties were introduced. 96 per cent of the area is under dry land farming. Hence, dry farming technology is used to get top yield by tapping rain water.

There are no major industries. Two industrial estates, one at Silvassa on cooperative basis and the other government - owned Industrial Estate at Masat have been established. A new industrial estate at Khadoli is coming up. No. of industrial units with permanent registration increased to 197 by the end of March '85. All together 187 units (including medium scale units and 30 cottage village industries) are functioning generating employment for 5700 persons.

The products manufactured include spectacle frames and flooring tiles, buckets, bread & biscuits, furniture, katha and tenin, spun pipes, plastic moulded articles, chemicals, detergent powder, art silk fabrics, electrical fixtures, watches, candles, tin containers, chappals, rexine cloth, foam, etc.

Administrator: Dr. Gopal Singh.



DELHI

Area: 1,483 sq.km; **Capital:** Delhi; **Population:** 62,20,406; **Languages:** Hindi, Punjabi and Urdu; **Literacy:** 61.54%.

The territory of Delhi shines with the reflected glory of a metropolis that functions as the capital of India. But beyond the

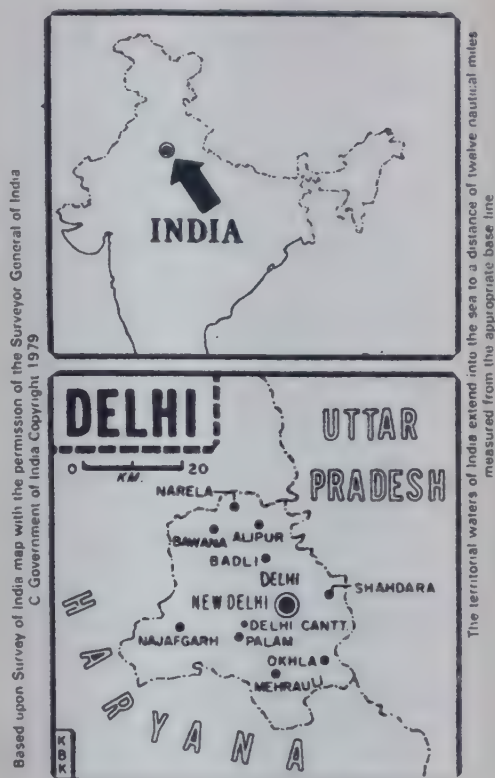
confines of the metropolis and shorn of its imperial associations, this territory is much better and greener than any other territory of India.

Physiography. The territory forms an enclave inside the eastern frontier of Haryana in North India. The climate of the territory is influenced by its inland position with the desert of Rajasthan to the west and south-west and Gangetic plains of U.P. to the east. Extreme dryness with an intensely hot summer and cold winter are the characteristics of the climate. The year can broadly be divided into four seasons. The cold season starts in late November and extends to about the beginning of March. This is followed by the hot season which lasts till about the end of June when the monsoon arrives. The monsoon continues into the last week of September. The two post-monsoon months October and November constitute a transition period from the monsoon to winter conditions.

History. The city of Delhi was founded in the 11th century A.D. by a Rajput Chieftain of the Tomara clan. The Chauhans obtained possession of the city from the Tomaras. Prithvi Raj, the Chauhan ruler of Ajmer and Delhi, made the city of Delhi famous by his heroic valour and romantic adventures. Delhi under Prithvi Raj and Kanauj under Jai Chand were the principal kingdoms of north India at the time.

The first invasion of India by Muhammad Ghorī was beaten back by Prithvi Raj in the first battle of Tarain in 1191. Next year, Ghorī came back to avenge his defeat and in the second battle of Tarain (1192) the Rajput army was routed. Prithvi Raj was captured and put to death. Delhi thus passed into the hands of Muslim rulers for the next six centuries. Under the Mughal Emperors, Delhi became a world famous city.

In 1857, following the mutiny of Indian troops, the British deposed the titular Emperor Bahadur Shah and formally annexed Delhi. In 1912, the capital of British India was transferred from Calcutta to Delhi. A new city—New Delhi—of imposing dimensions was laid out by the side of the old city—Old Delhi—by the British Indian Government. Independent India has retained this historic capital.



Administration. Delhi became a Union Territory on November 1, 1956. In order to enable a larger measure of association of the representatives of the people of the Union Territory with developmental activities, parliament enacted the Delhi Administration Act 1966. Under this Act, Delhi has an elected Metropolitan Council consisting of 61 members, five of whom are nominated by the President of India.

The Lt. Governor is the Administrator. He is assisted by 4 Executive Councillors (One Chief Executive Councillor and three Executive Councillors) appointed by the President of India on the recommendation of the Union Home Ministry.

The Territory is made up of three Census towns, Delhi, New Delhi and Delhi Cantt, and 214 villages. It is represented by 7 members in the Lok Sabha and 3 members in the Rajya Sabha. The territory is covered by 3 local bodies—Delhi Municipal Corporation, New Delhi Municipal Committee and Cantonment Board. The rural area of the territory falls within the jurisdiction of Municipal Corporation of Delhi.

Delhi Units.

Name	Urban/ Rural	Population 1981
New Delhi Municipal Committee	(Urban)	273036
Delhi Cantonment Board	(Urban)	85166
Municipal Corporation of Delhi	(Urban)	5409998
	(Rural)	452206
Total		6220406

State of Economy. In Delhi 31.93 per cent of the total population constitutes workers (1981 census). Percentage distribution of workers according to main activity revealed that cultivators constitute 1.93 per cent, agricultural labourers 0.86%, household industry 3.76% and other workers 93.45%.

Delhi ranks third in *literacy* after Kerala and Chandigarh which hold the first and second positions. Percentage of literacy in 1981 was 61.54 (68.40% males and 53.07% females).

Delhi has a total land area of 147488 ha. of which 1444 ha. area is forest and 56729 ha. is not available for cultivation. Other uncultivated land excluding fallow, comes to 2908 ha.

About 98930 ha. is cultivated. Chief crops in 1982-83 production (in 1000 tonnes), were: wheat 130, jowar and bajra 15, sugar cane (gur) 0.13.

Since 1974 a large number of industrial concerns have been established. These include factories for the manufacture of razor blades, sports goods and parts for radios,

bicycle and station wagons plastic and PVC goods including footwear. The number of industrial units functioning was about 54000 in 1982-83. The number of workers employed was 5,07,000, production was worth Rs 2352 crore and investment was about Rs 1035 crore.

Some traditional handicrafts for which Delhi was formerly famous, still flourish. Among them are ivory carving, miniature painting, gold and silver jewellery, etc. The handwoven textiles of Delhi are particularly fine, this craft having been successfully revived.

Tourist Centres. Since Delhi has been the Capital of India for centuries, it is full of rich monuments. Both the Delhis - the old city of the Mughals formed by Shah Jehan and the new city constructed by the British in 1931 - preserve centres of Tourist interest.

Among them are Rashtrapati Bhavan, Mughal Gardens, Parliament Buildings, Chandni Chauk, Red Fort, Juma Masjid, Raibat Raj Ghat, Shantivana, Vajra Ghat, Purana Kila (Indraprastham), Humayun's Tomb, Lodi Tomb, Qutb Minar, Haus Khas, Safdarjung's Tombs, Jantar Mantar and India Gate.

The Zoological Garden, Kashmir Gate, India Gate, Birla Mandir, Vigyan Bhavan, National Museum, Cannought Circus, Budha Jayanti park, Rabindra Rangshala and Nehru Memorial Museum are also of importance.

Besides, Agra, the city of Taj Mahal, Mathura of Srikrishna legends, Tuglagabad, Surajkund, Lakshmi Narayan Temple, Sohna, Sultanpur Lake, etc are also around.

Lt. Governor: Air Vice Marshal H.L. Kapoor.
Chief Executive Councillor: Jag Parvesh Chandran.

GOA, DAMAN AND DIU

Area: 3814 sq km; **Capital:** Panaji. **Population:** 10,86,730; **Languages:** Konkani, Marathi and Gujarati; **Literacy:** 55.86%.

Goa, Daman and Diu celebrated the silver jubilee of its existence under the Indian Union in 1985. These are three different landblocks on the West Coast of India lying far apart from one another. They have come to form one political unit after liberation from the erstwhile Portuguese regime and have

been added as such to the Indian Union.

Physiography. Goa is situated between the coastal borders of the Karnataka and the Maharashtra States. It is bounded on the north by the Terekhol river, on the east and south, by the land boundaries of the Karnataka State and on the west by the Arabian Sea. While Daman lies on the Gujarat coast, Diu is an islet on the southern fringe of Kathiawar peninsula.

Goa is hilly terrain, especially on its eastern side where lies the northern end of the Sahyadri range. The important rivers flowing westward and providing a network of internal waterways are Mandovi, Zuari, Terekhol, Chapora, and Betul, which are navigable for a total length of 253 km.

Daman is bounded on the north and south by the Bhagwan and the Kalem rivers respectively, on the east by the Gujarat State and on the west by the Arabian Sea.

Diu, a tiny islet in the Gulf of Cambay near Veraval Port is separated from the southern extremity of the Saurashtra Peninsula by a narrow channel running through a swamp. The island is connected with the mainland by a narrow channel on the north.

The climate of Goa is warm and humid. There is little variation in temperature over the year. The normal rainfall varies from 2800

3500 mm. Daman has a mild and humid climate while Diu has a sultry climate.

History. Goa has been a very important historical and cultural centre since the earliest times. It was known as Gopakpattan or Gomant which figure in the Bhishma - Parva of the Mahabharata. It was also mentioned as Govapuri in the Suta-Samhita. Ptolemy, the great geographer (2nd century A.D.) refers in his geography to Goa as "Gouba". Later on, during Kadamba times it was also known as Gopapuram or Gove.

The earliest known history of the territory which included the adjoining lands of the neighbouring states can be traced back from the Mauryas. Goa was under the Satavahanas from 2nd century B.C. and thereafter, under the sway of the western Kshatrapas from 150 A.D.

Chalukyas of Badami ruled over it for over 200 years since 540 A.D. After the fall of Badami Chalukyas Rastrakutas dominated the area including Goa for over 220 years from 753 A.D. to 973 A.D.

Kadambas of Goa replaced them and put it under their sway from 1008 A.D. to 1300 A.D. when Goa turned out to be a great centre of marine trade. Thereafter Goa came under the control of Yadavas of Devagiri, Delhi Sultans (1356 to 1378 A.D.) and Vijayanagar Rulers (1378 to 1470 A.D.) Bahamani Sultans of Deccan and later on Adilshahis of Bijapur (1470 to 1510 A.D.).

Statehood for Goa

Goa began celebrating the Silver Jubilee of her liberation from Portuguese rule on Dec. 19, 1985.

Prime Minister, Mr. Rajiv Gandhi, inaugurated the year-long celebrations by paying tributes to martyrs at a specially-built Martyrs Memorial at Patradevi near Panaji. Later he dedicated the memorial to the people at a public meeting.

A boat cruise in the Mandovi river to acquaint the Prime Minister with the glimpses of the rustic life of Goa was another highlight.

He dedicated to the memory of Goa's artist and vocalist, Master Dinanath Mangeshkar, an airconditioned auditorium at the Kala Academy complex.

Responding to the suggestion at the public meeting the Prime Minister assured the people that the demand for full statehood for Goa is under the active consideration of the Government.

In 1534, Diu off the southeast coast of Kathiawar (Gujarat) was occupied by the Portuguese. In 1559, Daman on the Gujarat coast, 70 miles from Bombay, was annexed by them, in 1560. Inquisition which was established in Goa, largely contributed to the downfall of the Portuguese empire in the East.

It continued till 1812 with a brief break of four years from 1774. The Portuguese made the city of Panaji as the capital of Goa in 1843. The Portuguese Territory of Goa, Daman and Diu was finally liberated on December 19, 1961.

Under the Constitution (Twelfth Amendment) Act 1962, Goa was included in the first schedule to the constitution as a territory of the Indian Union.

In 1966 Parliament enacted the Goa, Daman and Diu Opinion Poll Act. In accordance with the provisions of the Act, an Opinion poll was held in January 1967 to ascertain whether Goa, Daman and Diu wanted to be a Union Territory or to merge with the adjoining states of Maharashtra and Gujarat. Goa,

Daman and Diu voted to continue as a Union Territory.

Administration. The Goa region has been declared as one district with a district magistrate, and two sub-divisions Panaji and Margao and 11 Talukas. Daman and Diu have no subdivisions. The Daman region is under the charge of a Collector while Diu is under the charge of a Civil Administrator.

Districts

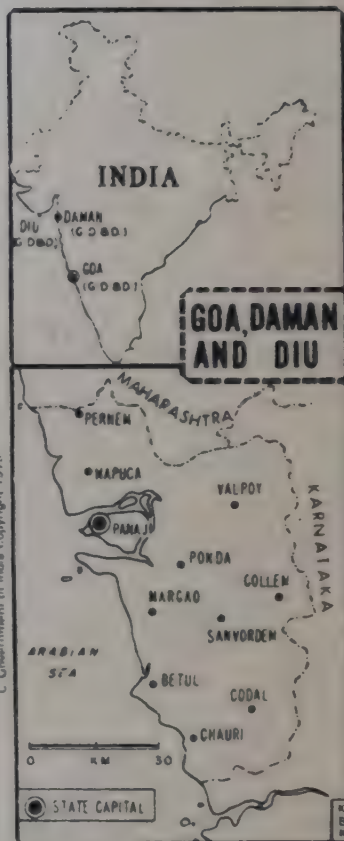
District	Area (sq.kms)	Population (1981) Census	Headquarters
Goa	3702.0	10,07,749	Panaji
Daman	72.0	48,560	Daman
Diu	40.0	30,421	Diu
Total	3,814.0	10,86,730	

State of Economy. Paddy is the staple crop of the Territory covering 56,292 ha. (Covering double cropping, high yielding variety and local variety) of the total cropped paddy area 10,070 ha was under rabi and 44,812 ha under khariff during the year 1984-85.

Ragi is the next important food crop covering 8648 ha. Area covered by other cereals millets and pulses is 14,288 ha. Area covered under sugarcane cultivation during 1984-85 was 1,595 ha.

Since the fourth five-year plan there has been a steady growth in the number as well as in the size of industries. The territory changed into an industrial economy. By the end of March 1985, the size of the industrial base assumed board dimensions. There are 38 large and medium units employing around 6,000 persons covering a capital investment of more than Rs. 160 crore.

These include from iron ore pellets, cotton yarn. IMF liquor pesticides, automobile tyres, fertilizers, etc.



The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line

At the end of March 1985 the number of registered small scale units increased to 3187 employing 21,987 persons.

Tourist Centre. Goa is a picturesque land full of scenic charm. Historic forts, churches and temples intersperse with green hills, mountain, river creeks, fields and palm-fringed pearl white beaches. Basilica of Bom Jesus in Old Goa enshrines the sacred relics of St. Francis Xavier.

Panaji, Dona Paula, Gaspar Dias beach, Calangute beach, Colva beach, Arvalem waterfalls, Vasco da Gama, Dudhsagar waterfalls, Marmagao port etc. are among the most sought after centres.

Lt. Governor: Dr. Gopal Singh; **Chief Minister:** Pratap Singh Rane (Congress).

LAKSHADWEEP

Area: 32 sq. km; **Capital:** Kavaratti; **Population:** 40,249; **Language:** Malayalam, **Literacy:** 27.8%.

The tiniest Union Territory of India, Lakshadweep is an archipelago consisting of 12 atolls, three reefs and five submerged banks.

Of its 36 Islands covering an area of 32 sq. km, only 10 are inhabited. They are Andrott, Amini, Agatti, Bitra, Chetlat, Kadmat, Kalpeni, Kavaratti (Headquarters), Kiltan and Minicoy. Bitra is the smallest of all having only a population of 181 persons (1981).

Physiography. Lakshadweep lies about 220 to 440 km from the coastal city of Cochin in Kerala between 8° and 12° 13' north latitude and 71° and 74° east longitude. Kavaratti is its headquarters. These Islands are linked with Cochin by ship, which takes about 10 to 20 hours.

Though the land area is extremely small, if we consider its lagoon area of about 4,200 sq. km, 20,000 sq. km of territorial waters and about seven lakh sq. km of economic zone, Lakshadweep is one of the largest territories of our nation.

The flora of the Islands includes Banana, Vazha (*Musa Paradisiaca*), Colocasia, Chambru (*Colocassia antiquarum*), Drumstick, moringakki (*Moringa Oleifera*), Bread-fruit, Chakka (*Artocarpus incisa*), wild almond (*Terminalia catappa*) are grown extensively. Some of the shrub jungles plant like kanni (*Scaevola keenigii*), Punna, (*Calophyllum inophyllum*), Chavok (*Casuarina equisetifolia*), Cheerani (*Thespesia populnea*) are unevenly grown throughout the Islands. Coconut, Thenga (*Cocos nucifera*) is the only crop of economic importance in Lakshadweep. These are found in different varieties such as Laccadive micro, Laccadive ordinary, green dwarf, etc. Two different varieties of sea grass are seen adjacent to the beaches. They are known as *Thalassia hemprichii* and *Cymodocea isoetifolia*. They prevent sea erosion and movement of the beach sediments.

The marine life of the sea is quite elaborate and difficult to condense. The commonly seen vertebrates are cattle and poultry. Oceanic birds generally found in Lakshadweep are 'tharathasi' (*Sterna fuscata*) and 'karifetu' (*Anous stolidus*). They are generally found in one of the uninhabited Islands known as 'PITTI'. This Island has been declared a bird sanctuary.

History. Early history of Lakshadweep is unwritten. Local traditions attribute the first settlement on these Islands to the period of

Cheraman Perumal, the last King of Kerala. It is believed that after his conversion to Islam, at the behest of some Arab merchants, he slipped out of his capital Cranganore, the present day Kodungalloor—an old harbour town near Cochin, for Mecca.

When his disappearance was discovered, search parties sped for the King in sailing boats and left for the shores of Mecca, in search of the King from different places. It is believed that one of these sailing boats of Raja of Cannanore was struck by a fierce storm and they were shipwrecked. After being tossed for many days in the Arabian Sea, they finally landed on the Island now known as Bangaram. From there, they went to the nearby island of Agatti. Finally the weather improved and they returned to the Mainland sighting other islands on their way. It is said that after their return, another party of sailors and soldiers were sent who discovered the Island of Amini and started living there. It is believed that the people sent there were Hindus. Even now unmistakable Hindu social stratification has been existing in these Islands despite Islam.

There are communities who are primarily land owners (Koyas), sailors (Malmis) and cultivators (Melacheris). Legends say that small settlements started in the Islands of Amini Kavaratti, Andrott and Kalpeni first and later people from these Islands moved to other Islands of Agatti, Kiltan, Chetlat and Kadmat. This legend of Cheraman Perumal is not, however, fully substantiated.

The advent of Islam dates back to the 7th century around the year 41 Hijra. Saint Ubaidulla is believed to have preached Islam to the islanders. The grave of Saint Ubaidulla at Andrott is today a sacred place. Preachers from Andrott are respected deeply in far off lands like Sri Lanka, Malaysia, Burma etc.

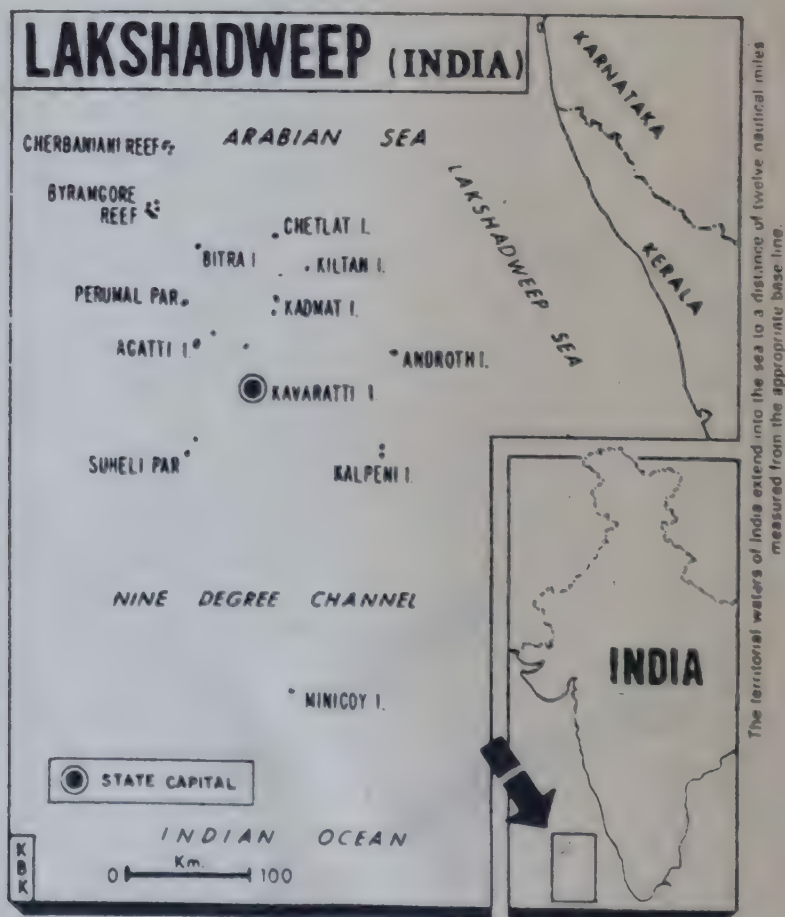
The arrival of the Portuguese in India again made Laccadives an important place for the seafarers. It was also the beginning of the year of plunder for the Islands. The finely spun coir was much sought after for ships. So the Portuguese started looting Island vessels. They forcibly landed at Amini to procure coir some time in the early 16th century, but it is said that the people killed all the invaders by poisoning. The Portuguese invasion ended thus.

Even after the conversion of the entire Islands to Islam, the sovereignty remained in the hands of the Hindu Rajah of Chirakkal for some years. From the hands of the Chirakkal Raja, the administration of the Islands was passed on to the Muslim house of Arakkal of Cannanore around the middle of the 16th century.

The Arakkal rule was oppressive and unbearable. Some time in the year 1783 some Islanders from Amini took courage and went to Tippu Sultan at Mangalore and requested him to take over the Administration of the Amini groups of Islands. Tippu Sultan at that time was on friendly terms with the Bibi of Arakkal and after deliberations, the Islands of Amini group were handed over to him. Thus the Islands suzerainty came to be divided as five under the sovereignty of the Tippu and the rest continued under the Arakkal rule.

After the battle of Seringapattom in 1801 Tippu Sultan handed over the Islands to the British East India Company and the Islands were administered from Mangalore. In 1847 a severe cyclone hit the Island of Andrott and Raja of Chirakkal decided to visit the Island in order to assess the damages and for distributing relief.

An officer of the East India Company Sir W. M. Robinson volunteered to accompany him. On reaching Andrott, the Rajah found it difficult to meet all the demands of the people. Sir William then offered the Raja to help him in the form of loan. This was accepted. This arrangement continued for about four years but when the loans started mounting, the English asked the Rajah to repay which he could not. In 1854 all the remaining Islands were handed over to the East India Company for administration. So, came the British rule.



Based upon Survey of India map with the permission of the Surveyor General of India
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The Union Territory was formed in 1956 and it was named Lakshadweep in 1973

Administration. Prior to the formation of this Union Territory on 1 Nov. 56, these Islands formed part of the erstwhile Madras State. The entire group of Islands is considered as one District and divided into four Tansils and put in charge of a Tahsildar, each except Minicoy where the post of the Tahsildar was abolished and a Deputy Collector appointed in August, 1978. The lowest revenue official in each Island was known as 'Amin' in Laccadive group and Minicoy and Karani' in Amindivi group. Now they are designated as 'Amin' in all Islands.

The Headquarters of the Administration were shifted from Calicut (Kerala State) to Kavaratti Island in March 1964. When the annual expenditure to be incurred by the Administration went beyond Rs. 3 crore, the necessity for decentralisation of the departments was felt and accordingly new offices were created in 1972.

Area and Population

Islands (inhabited)	Area (sq. km)	Population (1981 census)
Minicoy	4.4	6,658
Kalpeni	2.3	3,543
Andrott	4.8	6,812
Agatti	2.7	4,111
Kavaratti	3.6	6,604
Ameni	2.6	5,367
Kadmat	3.1	3,114
Kiltan	1.6	2,375
Chetlat	1.0	1,484
Bitra	0.1	181
Total	26.2	40,249

State of Economy. Agriculture is the mainstay of Lakshadweep's economy. The staple products of the Territory are coconuts and coir. Coconut is the main crop occupying the entire cultivable area of 2785 ha. The total palm population is 0.64 million with 0.16 million bearing trees. The average production is 8078 nuts per ha per year with an average yield of 58 nuts per palm which is definitely higher than the average production figures of major coconut producing countries.

Fruit plants like banana, papaya, guava,

sapota and citrus varieties and drumstick plants are cultivated in the coconut gardens as inter-crops. Agricultural Demonstration Farms of the Administration in all islands supply vegetables to the people.

Multi-crop demonstration plots extending to a gross area of 260 ha. engaging 640 labourers are available in the islands.

The islands produce copra, coir, jaggery, vinegar and fish. Trade in coir is a monopoly of the Administration and is being carried on as a welfare measure on a no-profit-no-loss basis, by bartering rice for coir. The average copra produced is about 2500 tonnes per annum, of which 2000 tonnes is sold through Calicut and Mangalore markets.

The islands have immense potential for the development of fisheries. Two Boat Building Yards are engaged in construction of mechanised boats in Lakshadweep. Over 295 mechanised boats are under operation in Lakshadweep waters, of which 265 were issued to the fishermen under hire-purchase system at subsidised cost. Fish catch during a year is estimated at 3224 tonnes. The Canning factory at Minicoy processes the Tuna fish.

The main household industry is coir making. Six coir production-cum-demonstration centres are functioning one each at Kadmat, Kiltan, Chetlat, Ameni, Agatti and Andrott.

These centres produced 884 tonnes of improved variety thinner coir yarn during 1983-84. The mechanised decorticating units at Andrott, Kadmat, Ameni and Kavaratti extracted 136 tonnes brown fibre from dry coconut husk during 1983-84. The hosiery factory at Kalpeni produced 30450 vests during this period. The Handicraft Training Centres at Kavaratti and Kalpeni are continuing to impart training to local candidates in making coral flowers, sea-shell toys, coconut shell crafts, coir crafts etc. One Furniture-Makers' Industrial Co-operative Society and one Handicraft Industrial Co-operative Society are also functioning at Kavaratti. Two Coir Co-operative societies have been started at Ameni and Kalpeni with trained local women as members.

Tourist Centres. The Development of domestic as well as international tourism has immense potential. However, much

could not be achieved till recently owing to the strict entry restriction imposed on visitors from the Mainland. Ministry of Home Affairs has now made some relaxation and as a result of this, international as well as domestic tourism has received a remarkable boost.

Already numerous infrastructural facilities have been created. A proposal for the construction of an air-strip at Agatti, near

Bangaram is receiving active consideration at the Centre. Since the literacy rate in the Union Territory is one of the highest in the country, the level of educated unemployed can be kept under control by developing this sector. Society for Promotion of Recreational Tourism (SPORTS) is a society registered under the Societies Act, 1860.

Administrator. Omesh Saigal.

MIZORAM

Area: 21081 sq. km; **Capital:** Aizwal; **Population:** 4,93,757; **Languages:** Mizo and English; **Literacy:** 59.50 %.

Mizoram, in the local language, means the land of Mizos—Mizo itself means high-lander (mi-persons and zo-hills or uplands). Under the British administration, Mizoram was known as Lushai Hills District. In 1954 by an Act of Parliament the name was changed to Mizo Hills District. In 1972, when it was made into a Union Territory, it was named Mizoram.

Physiography. Mizoram occupies the north east corner of India. It is bounded on the north by the District of Cachar (Assam) and the State of Manipur, on the east and south by Chin Hills and Arakan (Burma), on the west by the Chittagong hill tracts of Bangladesh and the State of Tripura.

Mizoram is a land of hills. The hills run in ridges from north to south. They have an average height of 900 metres, the highest point being the Blue Mountain (Peak) in the south which rises to a height of 2165 metres.

The most important and useful rivers are the Tlawng (or the Dhaleswari), the Soni and the Tuivawl, which drain the northern area of the Territory and eventually join the Barak. The southern area is watered by the Koldine and its tributaries and the western area by the Karnaphuli with its tributaries. Chittagong in Bangladesh is situated at the mouth of this river.

The valleys are unhealthy during the rainy season, wet and enervating. In the higher areas, the climate is pleasant, generally cool in summer and not very cold in winter. In March-April violent storms from the north sweep over the hills. The average rainfall between May and September is 254

cm a year. Aizwal in the north records an annual rainfall of 208 cm while Lunglei in the south records 350 cm.

History. The Mizos belong to the Mongolian race. They seem to have settled at first in the Shan State of Burma. Two of the tribes, the Lushai and the Hmars, left Burma and moved westwards into India. They occupied the Lushai Hills.

During the British administration, the Mizos raided British territories and even attacked fortified positions. The British army moved against the Mizos and occupied their territory. It was annexed to British India in 1891. In 1898, the entire Mizo territory was formed into the Lushai Hills District and made a part of Assam. Although the Mizos were subjugated, the British did not interfere with their internal administration. The Mizo Chiefs carried on the day-to-day administration in the traditional manner.

With independence, Mizoram became a district of Assam. Because of neglect by the authorities, the Mizos felt that it was a bad bargain for them to continue as part of India and started agitations.

The conversion of Mizoram into a Union Territory in 1972 did much to assuage Mizo feelings. Nevertheless, insurgency continued. On Sept. 8, 1974, the Administration declared the whole of the Union territory as a disturbed area. Armed Forces (Special Powers) Act also was invoked.

The Mizos are divided into various tribes—the Lushais, Pawis, Paithes, Ralteise, Phangis, Hmars, Kukis, Maras, Lakhers, etc. In the 19th century the Mizos came under the influence of British missionaries and many Mizo were converted to Christianity.

The Mizo language had no script of its

own. The missionaries introduced the Roman script for the Mizo language and started teaching English also. The cumulative result was a high precentage of literacy. Some of the tribes are more educated than the others—the Lushais, for instance, showed a literacy percentage of 86. The majority of the tribes are Christians and speak Mizo and English. But some tribes on the border like the Chakmas are Buddhist and speak Bengali.

Administration. Mizoram has a single-chamber legislature consisting of 33 members. The territory has three Districts, 9 Sub-Divisions, 3 autonomous Hill District Councils, 6 Towns (as per 1981 census), 23 Police Stations and 301 Village Councils (instead of Gram Panchayats).

Districts

District	Area (sq. km)	Population (1981)	Headquarters
Aizwal	12588	340826	Aizwal
Lunglei	4536	86511	Lunglei
Chhimtutipui	3957	66420	Chhimtutipui
Total	21081	493757	

State of Economy. Agriculture is practically the only occupation in Mozoram. The territory is famous for its fibreless ginger, although other cash crops like mustrad, sesame and super-size potatoes are also grown. However, the cultivation method— "Jhum"—is very primitive and destructive. The Mizoram Government is now trying to induce the peasants to change over to more permanent systems of cultivation like terraced farming on the hill sides. There are also schemes to grow plantation crops like rubber, coffee, tea, etc.

Paddy is the chief food crop, followed by maize. They are grown on the slopes of hills.

There is no major industry in Mizoram. Handloom and handicraft are the major

industrial activities in the Territory and one Engineering Unit had developed a new design of machine-combined ginning and carding.

Tailoring, knitting and embroidery centres have been set up.

Sericulture was in existence in Mizoram for a long time. Sericulture consists of culture and practice of 4 kinds of silk, ie., (1) Mulberry, (2) Eri, (3) Tasar, (4) Muga.

Other industries are: Ginger beverages, oil, fruits preservation, handloom and some other small scale & cottage industries like bakery, printing press, saw mills, brick making, soap making, etc.

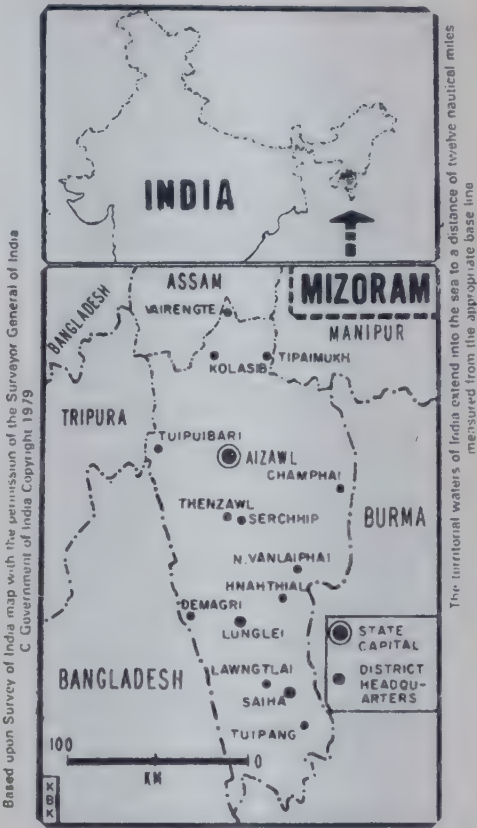
Lt. Governor: Hari Sankar Dubey; **Chief Minister:** M. Lalthanhawala. (Congress).

PONDICHERRY

Area: 492 sq.km; **Capital:** Pondicherry; **Population:** 6,04,471; **Languages:** Tamil and French; **Literacy:** 54.23%.

Physiography. The Union Territory of Pondichery encompasses an area of only

492 sq.km with Pondicherry town and its villages covering 293 sq.km surrounded by the South Arcot District, Karaikal town and its villages covering 160 sq.km surrounded by Thanjavur District, Mahe and its villages



covering 9 sq.km surrounded by the Kerala State, and Yanam covering 30 sq.km within the East Godavari District in Andhra Pradesh. While Pondicherry, the headquarters of the Union Territory, lies 162 km south of Madras and 22 km north of Cuddalore, Karaikal is about 150 km south of Pondicherry and Yanam about 840 km north-east of Pondicherry on the Andhra coast. Mahe lies almost parallel to Pondicherry, 653 km away on the West Coast.

The French first established their foot hold in Pondicherry in 1674; Karaikal was obtained from the King of Tanjore in 1738. Mahe was made over to the French by the ruler of Badagara in 1721. Yanam came into their possession in 1731.

Pondicherry and its surrounding enclaves lie on the drainage basin of the Gingee river. Karaikal located in the fertile Cauvery delta is fed by the waters of Arasalar (running a distance of 11.97 km in the region), Natter (11.2 km), Vanjiar (9 km), Nular (13.77 km), Puravadaiyaran (5.3 km) Thirumalirayanar (5.13 km) and the Nandalar (15.15 km).

River Mahe forms the northern boundary of Mahe town separating it from the enclaves of Kallayi and Naluthara on the north. The Coringar river, which is a branch of Gautamin Godavari river flows through the town of Yanam.

History. Pondicherry entered modern history when the French East India Company established a settlement there in 1673. The French converted this obscure little village into a flourishing trading centre. French was the last European power to come to India for trade. The Dutch and the English had already established themselves at various centres in India. The Portuguese who came first were by this time a spent force. It was quite natural that rivalries should arise among the later powers for dominance in India. Actually what brought them into conflict in India was rivalry at home, that is, in Europe. The Dutch were the first to cross swords with the French. They captured Pondicherry in 1693 but returned it to France under the Treaty of Ryswick in 1699. Pondicherry regained its prosperity in a few years. In 1706 Pondicherry had a population of 40,000 while the English town of Calcutta had barely 22,000.

In the meantime, the French East India

Company had run into financial difficulties and the Company was forced to abandon their trading posts in Bantam, Surat and Masulipatnam. In 1720 the Company was reconstituted as the "Perpetual Company of the Indies" and new French establishments sprang up in the East. Mauritius was occupied in 1721, Mahe on the Malabar Coast soon after, Yanam in 1731 and Karaikal in 1738. With the appointment of Dupleix as Governor of Pondicherry in 1742 France became involved in Indian politics. Dupleix harboured ambitions of establishing a French Empire in India.

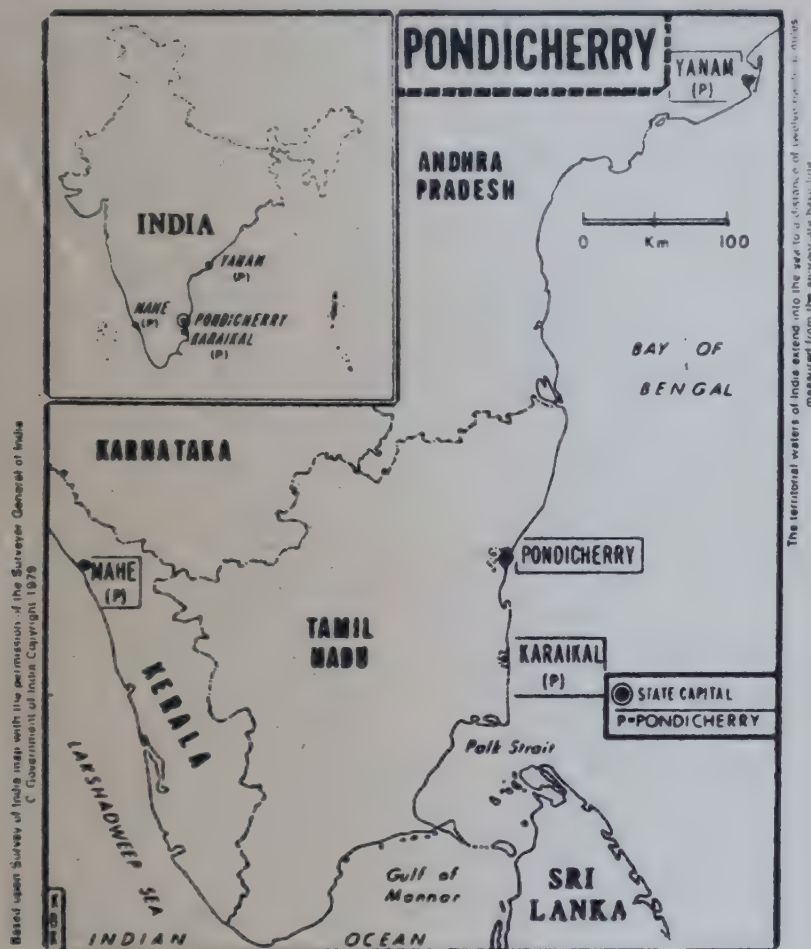
When the Austrian Succession War (1742-48) broke out in Europe, England and France took opposite sides. Anglo-French hostility spread to India. The English captured some French ships. Dupleix reacted sharply. He captured Madras in 1748. The Austrian War of Succession was ended by the Treaty of Aix-La-Chappelle and Madras was returned to the English. Fresh hostilities, however, broke out between the English and the French in India. Pondicherry changed hands according to the fortunes of the Anglo-French wars. The English captured Pondicherry in 1761, returned it in 1765, retook it in 1778, captured it a third time in 1793 and finally restored to France in 1814.

When at last British paramountcy was established in India, Pondicherry ceased to be of any political importance and the British let the French continue in their possessions in India. The French Government handed over the Administration of their territories in India to the independent Government of India in November, 1954. The territories thus handed over were constituted into the Union Territory of Pondicherry.

Administration. Pondicherry is administered by the President of India through a Lt. Governor who is advised by the Council of Ministers which is responsible to the legislative assembly consisting of 33 mem-

Districts

District	Area (sq km)	Population	Headquarters
Karaikal	160	1,20,010	Karaikal
Mahe	9	28,413	Mahe
Pondicherry	293	4,44,417	Pondicherry
Yanam	30	11,631	Yanam



bers. Normally the Council of Ministers under a Chief Minister carries on the Administration directly.

State of Economy. Nearly 45% of the population in the Territory are engaged in agriculture and allied pursuits. In all 88% of the cultivated area is irrigated. The intensity of irrigation is as high as 147%. Rice is the main food crop. Other minor food crops grown in the area are pulses, ragi and bajra. Sugarcane, groundnut, coconut and cotton are the principal cash crops. The cropping intensity is 185%.

Though an ambitious programme was drawn up to achieve target foodgrains production of 1,20,000 MT during 1983-84 due to late release of canal water in Karaikal, (only of the regions of this Union Territory) double cropped area was reduced to single cropped area.

There are 10 large scale industries, (6 Textile Mills and two Sugar Mills, one Paper Mill and one Caustic Soda Unit) and 11

Medium Scale Industries, one distillery, one brewery, four rice bran oil extraction units, one alternative Energy unit, one Potassium Chlorate unit, one Precision Lenses manufacturing unit, one auto spares manufacturing unit and one flour mill, which provide employment to 16,000 persons.

This apart, there are 2,190 registered Small Scale Industries generating employment opportunities to 15,000 persons.

Tourist Centres. Pondicherry is a living monument of French culture in India. Ending the Coromandel coast it reposes in the eternal embrace of the tidal waves.

Among the places of interest are Government palace, Beach, Auroville, Sri Aurobindo Ashram, Baharatiyar Samadhi, French Institute, Jawaharlal Institute of Post-Graduate Medical Education and Research, Indian Institute of Indology, Romain Rolland Library, Botanical Garden, Alliance Francoise, Ous-

teri Lake, Joan of Arc Square, Temples and Churches.

Lt. Governor: Tribhuvan Prasad Tewary;
Chief Minister: M. O. H. Farook (Congress).

131. LOOKING BACK ON 1985

National Events

January

1. 10 villagers, alleged to be Naxalites, and two policemen killed in an encounter in Kaithi Bigha, Bihar; Doordarshan starts Malayalam telecast from Trivandrum.

2. Karnataka Assembly dissolved; Gegong Apang sworn in Chief Minister of Arunachal Pradesh; 23 persons killed in Mohaddipur, Uttar Pradesh, when a long-standing village dispute led to violence.

4. Rishang Keishing sworn in Chief Minister of Manipur.

5. P.N. Malhotra appointed RBI Chief.

8. Pratapsingh Rane sworn in Chief Minister of Goa.

10. Ravi Shastri hits Baroda left-arm spinner Tilak Raj for six sixes in one over of a Ranji Trophy cricket match.

11. Indian coast guard vessel captures Sri Lankan patrol boat; 1983 Jawaharlal Nehru award for International Understanding presented to former Austrian Chancellor Bruno Kreisky in New Delhi.

16. Balram Jakuar unanimously elected Speaker of the Lok Sabha.

17. A British film, *The Bostonians* and a Russian film, *Ruthless Romance*, share the Golden Peacock at the 10th International Film Festival of India in New Delhi; Adoor Gopalakrishnan's *"Mukhamukham"* wins the International Federation of the Film Press award at Delhi Film Festival.

18. Spy ring cracked. Top Government officials, businessmen held.

19. Dr. P.C. Alexander, Principal Secretary to the PM quits following the arrest of three aides in an espionage case.

25. Padma Vibhushan for M.G.K. Menon, Padma Bhushan for Thakazhi Sivasankara Pillai and Padmasri for P.T. Usha.

27. Asha Aggarwal wins Hong Kong international women's marathon.

28. Prime Minister Rajiv Gandhi, Greek Prime Minister Andreas Papandreou, Swedish Prime Minister Olof Palme, Tanzanian President Julius Nyerere, Mexican President

Miquel de la Madrid and Argentinian President Raul Alfonsin meet in New Delhi and call for the prevention of an arms race in outer space; 1984 Jawaharlal Nehru award for international understanding posthumously conferred on Indira Gandhi.

29. Sri Lanka releases 17 Indian fishermen and their boats, seized last year. India hands over Lankan patrol boat.

30. Anti-defection bill passed unanimously by the Lok Sabha.

31. Left Democratic Front wins all 3 by-elections to Kerala Assembly.

February

1. Mohammad Azharuddin becomes the first man in cricket history to hit a century in each of his first three tests; King Jigme Singye Wangchuk of Bhutan arrives in New Delhi on a state visit.

4. Tamil Nadu Chief Minister M.G. Ramachandran returns to Madras after miraculously recovering from a complicated illness in a US hospital.

6. 174 couples married in dowry-free community wedding at Keerampara, Kerala.

7. Two Kashmiri separatists sentenced to life imprisonment in Birmingham for the murder of Indian diplomat Ravindra Mhatre there in February 1984.

9. Cargo plane carrying arms from Lisbon to Colombo detained at Trivandrum, when it landed without fuel.

10. M.G. Ramachandran sworn in for a new term as Chief Minister of Tamil Nadu.

11. Polish Prime Minister Wojciech Jaruzelski arrives in New Delhi on a state visit.

12. A fire on M.V. Chidambaram, an Indian liner sailing from Singapore to Madras, kills 34.

14. Two Indian fishermen killed as Sri Lankan naval vessel opens fire on their boat; Dr. Nagendra Singh elected world court chief.

18. Punjab National Bank Chairman and

Latest Party Position

As on 31 Dec. 1985

Lok Sabha

Total Seats	544
Cong (I)	409
Telugudesom	30
CPI (M)	21
AIADMK	12
Janatha	11
Akali Dal	7
AGP	7
CPI	6
Cong (S)	4
J&K N. Conf.	4
RSP	3
Lok Dal	2
BJP	2
Muslim League	2
Forward Block	2
Kerala Cong.	2
DMK	2
UMF	1
PTCA	1
Unattached	9
Vacant	7

* Total 11 out of which 8 joined Cong(I).

Rajya Sabha

Total Seats	244
Cong (I)	158
CPM	13
AIADMK	11
Janatha	9
BJP	8
CPI	6
Lok Dal	5
Telugu Desom	5
DMK	3
National Conf.	2
Cong (S)	2
Akali Dal	2
Forward Bloc	2
RSP	1
Muslim League	1
Kerala Cong.	1
NNDP	1
NDPI	1
Janawadi	1
Janatha	1
Independents	6
Nominated	3*
Vacant	2

Managing Director S.L. Baluja, Central Bank Chairman and Managing Director B. V. Sonalker and Bank of Baroda Executive Director S.S. Master dismissed by the Government.

19. 13 Army Jawans and a civilian killed in an ambush by Naga insurgents in Manipur.

21. Independent Rajasthan MLA Raja Man Singh shot dead by police.

23. Rajasthan Chief Minister Shiv Charan Mathur quits, owning moral responsibility for the killing of Raja Man Singh; Heera Lal Deopura sworn in Chief Minister.

Train fire kills 70 in Madhya Pradesh.

March

1. Rajendra Sethia, the biggest personal bankrupt ever, arrested in New Delhi.

3. Mani and Joseph factions of Kerala Congress merge to form a single party.

5. The 9-square-foot Belgaum ballot paper carries the names of 301 candidates for an Assembly seat.

6. 51 persons are drowned as a boat capsizes off Cuddalore.

8. Ramakrishna Hegde sworn in Chief Minister of Karnataka, Virbhadra Singh Chief Minister of Himachal Pradesh and Nar-Bahadur Bhandari Chief Minister of Sikkim; V.M. Sudheeran elected Kerala Assembly Speaker.

9. N.T. Rama Rao sworn in Chief Minister of Andhra Pradesh.

10. J.B. Patnaik sworn in Chief Minister of Orissa, Hardeo Joshi Chief Minister of Rajasthan and Vasantrao Patil Chief Minister of Maharashtra; India beats Pakistan by 8 wickets in the final of the Benson and Hedges world championship of cricket in Melbourne. Ravi Shastri is declared champion of champions and Sunil Gavaskar steps down from the captaincy.

11. Madhavsingh Solanki sworn in Chief Minister of Gujarat, N. D. Tiwari Chief Minister of Uttar Pradesh and Arjun Singh Chief

Minister of Madhya Pradesh; Akali Dal president Sant Harchand Singh Longowal released

12. Arjun Singh named Punjab Governor. Mohammad Usman Arif appointed Governor of Uttar Pradesh and P. Venkatasubbaiah Governor of Bihar; Bindeswari Dubey sworn in Chief Minister of Bihar.

13. Prime Minister Rajiv Gandhi in Moscow for the funeral of Konstantin Chernenko, meets new Soviet leader Mikhail Gorbachev, US Vice-President George Bush, Pakistan President Mohammad Zia-ul-Haq and other world leaders; Motilal Vora sworn in Chief Minister of Madhya Pradesh.

14. Steep hike in passenger and freight rates in Bansi Lal's railway budget.

16. Finance Minister V.P. Singh presents innovative tax reductions and duty exemptions along with a deficit on Rs.3,349 crore in his maiden budget; M.O.H. Farook sworn in Chief Minister of Pondicherry.

17. The US embassy says that Soviet diplomat Igor Gueja, who disappeared in New Delhi, flew to the United States, sought and was granted asylum there.

18. Punjab National Bank manager Amarjeet Singh arrested on charges of conspiring with Rajendra Sethia and defrauding three Indian banks of over Rs.250 crores

21. Soviet embassy official Victor Khit-zichenko shot dead in New Delhi

24. BJP local unit general secretary Krishan Lal Manchanda and student leader Makhan Singh shot dead in Chandigarh.

26. Indian Airlines offers instant booking with its new computerized system.

29. India beats Australia by three wickets in the final of the Rothmans tournament in Sharjah to remain undisputed champs in limited overs cricket.

30. Chandrasekhar Singh sworn in Union Minister of State for Textiles; Four accused in Vypeen liquor tragedy case sentenced to 6 years rigorous imprisonment and a fine of Rs.11,000

April

2. Union Agriculture Minister Buta Singh excommunicated from the Sikh panth; Mauritian Prime Minister Aneerood Jugnauth in Delhi

5. More than 40 people travelling on the roofs of two trains killed after being hit by scaffolding erected to paint an overbridge in

Uttar Pradesh; Eight policemen killed in TNV ambush

6. Bombay wins the Ranji Trophy for the 30th time, beating Delhi by 90 runs in the golden jubilee year of the national cricket championship.

9. 15 die as IAF plane crashes in a village near Bareilly; Karunakaran Government survives no-confidence motion in the Kerala Assembly.

11. Judicial probe ordered into the riots in Delhi, following Indira Gandhi's assassination. Ban on the All-India Sikh Students Federation lifted.

13. British Prime Minister Margaret Thatcher meets Prime Minister Rajiv Gandhi in New Delhi.

15. New Zealand Prime Minister David Lange visits New Delhi.

19. Full diplomatic status for SWAPO representative in New Delhi; SPCC chief G.S. Tohra released.

21. NAM meet on Namibia adopts in New Delhi a resolution calling for sanctions against South Africa and an action plan to rush more economic and military assistance to SWAPO.

23. The Supreme Court awards maintenance to a divorced Muslim woman.

25. Lenin Peace Prize posthumously awarded to Indira Gandhi.

27. Union Government declares moratorium on 3 banks - Bank of Cochin, Lakshmi Commercial Bank, New Delhi, Miraj State Bank, Rajasthan.

May

1. S.P. Jogota, former Additional Secretary in the External Affairs Ministry unanimously elected chairman of the International Law Commission.

3. 65 drowned in boat disaster on the Chambal river in Madhya Pradesh.

5. CPM leader in the Lok Sabha Saradish Roy dead.

7. Adoor Gopalakrishnan adjudged Best Director (Mukhamukham) in national film awards.

10. Bombs that look like transistors explode in and around Delhi, killing more than 80 people. Punjab Lok Dal President Balbir Singh shot dead in Chandigarh; P.N. Bhagwati appointed Chief Justice of the Supreme Court.

13. Dr. P.C. Alexander appointed High

Indians Helping the US

Indians have aided America in their own way through the years and at present, 20,000 Indian professionals are settling in America every year and helping it in a big way in various sectors of the American economy and life, Mr. Harry A. Cahill, consul-general of USA in Bombay, said.

There is a demand in America for Indian scientists and professionals in fields like medicine, computer technology and electronics, as they have earned a good name for themselves in these fields. It is a little known fact that one-third of IBM's staff is made up of Indians and so is the case in many other big American corporations, including Boeing and Bechtel, Mr. Cahill said.

Speaking on "India's aid programme to the United States", at a meeting with the ladies wing of Indian Merchants' Chamber, Bombay, he said at present Indian software exports to the US were increasing at a big pace for all types of applications. Even the famous Miami police are using

software for combating crime, developed by a Bombay firm and if Indian doctors decide to leave America, most of the American hospitals will be badly hit, Mr. Cahill said.

He particularly praised the Indian Sikh community in California for contributing a lot to American agriculture. Americans have also not forgotten the monetary help given to them by Tipu Sultan during their independence struggle. The American transcendental school of literature has also been taken from India, he said. The money that came from the American ice sold to India in the 19th century helped finance their industrial revolution.

Regarding the future, Mr. Cahill said the co-operation can only increase what with Indian companies going in for the latest American technologies. The five-lakh Indians residing in America, comprising mainly of scientists and professionals, have an average income highest among any single group in America.

[TOI: Aug. 8, 1985]

Commissioner in Britain; The US Federal Bureau of Investigation claims to have foiled plot by Sikh extremists to assassinate Prime Minister Rajiv Gandhi.

19. Communist leader P. Sundarayya dead
20. Lok Sabha passes a bill providing tiffir punishment for terrorism.

22. Prime Minister Rajiv Gandhi visits Moscow and signs two agreements with General Secretary Mikhail Gorbachev

27. J.N. Dixit takes over as India's High Commissioner in Sri Lanka, 74 drowned in Chhambal boat accident. Kerala Health Minister K.P. Ramachandran Nair resigns from the cabinet

30. Moore Market destroyed in pre-dawn fire in Madras

une

1. Maharashtra Chief Minister Vasantrao Patil resigns.

2. Prime Minister Rajiv Gandhi and Sri Lankan President J.R. Jayewardene meet in

New Delhi, fly together to Dhaka and accompanied by President H. M. Ershad visit the cyclone-hit areas of Bangladesh

3. Shivajirao Patil-Nilangekar sworn in Chief Minister of Maharashtra: Central Government offices switch to 5-day week

5. Prime Minister Rajiv Gandhi meets Egyptian President Hosni Mubarak in Cairo
Kerala Electricity Minister R. Balakrishna Pillai resigns after a petition challenging his continuance in office was admitted in the High Court

7. Festival of India opens in Paris
Rajiv Gandhi meets French President Francois Mitterrand and Prime Minister Laurent Fabius; 50 people killed, more than 100 injured and thousands flee as the police forces of Assam and Nagaland clash at Merapani on the interstate border

10. Prime Minister Rajiv Gandhi meets President Chadi Benedet in Aiders

12. Nehru Science Award for M.G.K. Menon.

13. 37 persons killed in train collision near Agra.

16. Rajiv Gandhi concludes his first visit to the United States as Prime Minister. He meets President Ronald Reagan and other leaders, addresses Congress, answers questions at the National Press Club and is present at the opening of the Festival of India in America.

17. Rajiv Gandhi addresses the 71st session of the International Labour Organisation in Geneva. He also receives the John C. Philips memorial medal awarded to Indira Gandhi by the International Union for Conservation of Nature.

20. The Medal of Freedom, America's highest civilian decoration, presented to Mother Teresa by President Ronald Reagan in Washington.

21. Nitya Nanak and Nitya Ram, two ships belonging to a Bombay-based company with a total of 44 persons on board vanish off the coast off Tamil Nadu.

23. All 329 persons on board are killed as an Air-India Boeing 747 flying from Toronto to Bombay via Montreal, London and New Delhi crashes into the North Atlantic.

29. India's first batch of Mirage fighter planes arrive from France.

July

1. Air Chief Marshal L.M. Katre dead.

3. Davids Antony la Fontaine appointed Air Chief Marshal.

6. Gujarat Chief Minister Madhavsinh Solanki resigns. Home and Education Minister Amarsinh Chaudhary takes over.

8. Talks open in Thimphu between representatives of the Sri Lankan Government, the Tamil United Liberation Front and five Tamil militant groups.

11. The cockpit voice recorder and the digital flight data recorder of the Air-India Boeing 747 which crashed into the Atlantic picked up from under 6,700 feet of water by the SCARAB robot submarine operated from a French ship. Nothing had ever before been brought up from such a depth.

12. Mahesh Bhatt's Saransh, the official Indian entry at the Moscow International Film Festival, wins a special award.

14. Dr Rajinder Singh, Simla dentist, wins the world speed typing championship in

Sofia with a speed of 483 strokes per minute and an accuracy of 99.97 per cent.

16. Six Harijans killed by caste Hindus in Karamachedu, Andhra Pradesh.

19. Anti-reservation agitation in Gujarat withdrawn.

24. Prime Minister Rajiv Gandhi and Akali Dal president Sant Harchand Singh Longowal meet in New Delhi and sign an agreement ending the four-year agitation in Punjab; Maj Gen (Retd) F.D. Larkins, his brother Air-Vice Marshal K. H. Larkins and Lt Col Jasbir Singh sentenced to 10 years rigorous imprisonment for passing on classified information to American agents.

29. Jnanpith Award for Thakazhi Sivasankara Pillai.

31. Congress (I) MP Lalit Maken, his wife, and a visitor at their residence in Delhi shot dead by terrorists.

August

3. Ramon Magsaysay award for public service goes to Baba Amte; All India Muslim League merges with the Indian Union Muslim League.

7. Geet Sethi of India beats Bob Marshal of Australia 3,809-2,453 in the final of the world amateur billiards championships in New Delhi.

9. Gandhiji's ashram in South Africa destroyed by rioters.

13. 52 killed in Bombay house collapse.

15. Accord reached on the Assam foreign nationals issue. Agitation called off.

18. Assam Assembly dissolved.

19. Full bench of Kerala High Court dismisses petition against former Electricity Minister R. Balakrishna Pillai.

20. Akali Dal president Sant Harchand Singh Longowal shot dead near Sangrur. DCC (I) secretary Dev Dutt Khullar shot dead in Jalandhar.

28. INS Mysore, which played a prominent part in the liberation of Goa and in the Bangladesh war and had served the Indian Navy for 28 years, decommissioned.

September

1. Development officer Jawahar Deholakia of the Rajkot branch of the LIC enters the Guinness Book of World Records for having secured over Rs. 1 crore worth of business for the 17th year in succession.

4. Congress (I) metropolitan councillor

Share Schemes For Workers

The Government announced in 1985 two schemes to give workers a share in the equity of their companies.

Under the first scheme the stock issue would be linked to the savings of the employee. The conversion would take place after five years at a predetermined price which would be 80 per cent of the average mortgage price or its fair value, whichever is less. This scheme is proposed as voluntary both for the company and for employees.

In the second scheme, companies would propose the reservation of five per cent of the total public or rights issue for preferential allotment to their employees.

The guidelines regarding Employees' Stock Option Scheme and the Employees' Convertible Debentures are as follows:

The ESOS would extend to all public limited companies.

The scheme will be voluntary in nature—voluntary on the part of the employer company as also voluntary on the part of the employees/workers.

The scheme will be applicable to all permanent/regular employees and executives who are not of a casual/daily-wage nature.

The employees, etc. would be given three options of saving at three different rates (say Rs. 500, Rs. 1,000 and Rs. 2,000 per annum) under the stock option scheme. The savings would be for a period of five years. The employee would join the scheme in the base year by paying the initial contribution under either one of the three saving options which would be available.

At the start of the operation of the scheme, an instrument in the nature of a convertible debenture would be issued to the employees concerned. The instrument would not be transferable or tradeable till such time all the five annual instalments have been paid by the employee.

In the event of resignation, retirement, etc during the course of the scheme an employee will have the option to get back the money invested along with the interest as at the end of the relevant year.

Arjun Dass and his bodyguard Vajinder Singh shot dead in Delhi.

6. P.T. Usha declared Best Athlete at World Railways Meet in Olomouc, Czechoslovakia.

8. President Zail Singh promulgates an ordinance limiting the provision for countermanding of an election to the case of the death of a candidate set up by a recognised political party.

16. Chief Justice V.S. Malimath of Karnataka transferred to Kerala High Court and Chief Justice K. Bhaskaran of Kerala to Andhra High Court.

18. Nepal's King Birendra in New Delhi.

23. Uttar Pradesh Chief Minister N.D. Tiwari resigns.

24. Veer Bahadur Singh sworn in Chief Minister of Uttar Pradesh; Union Minister of State for Tourism and Civil Aviation Ashok Gehlot resigns.

25. Reshuffle of the Union Cabinet. K.R.

Narayanan becomes Minister of State for External Affairs and Krishna Kumar Deputy Minister for Family Welfare.

29. Surjit Singh Barnala sworn in Chief Minister of Punjab after a massive Akali Dal victory in the state elections; Prime Minister Rajiv Gandhi meets King Jigme Singye Wangchuk in Thimphu and receives Bhutan's highest honour, the Druk Wangyal Award, posthumously conferred on Indira Gandhi.

October

3. Morocco breaks diplomatic relations with India after New Delhi announced its recognition of the Saharawi Arab Democratic Republic proclaimed by the Polisario rebels fighting the Moroccan Government in the Western Sahara.

11. 4 jawans of the Indian Army's Everest expedition killed.

12. British police arrest 15 suspected terrorists amid reports that a plot to assassinate

ate Prime Minister Rajiv Gandhi has been cracked.

14. Rajiv Gandhi visits Britain. President Zail Singh visits Lakshadweep.

21. Prime Minister Rajiv Gandhi visits Havana and receives the National Order of Jose Marti, Cuba's highest honour, posthumously conferred on Indira Gandhi.

22. The Nelson Mandela medal instituted by the Holland committee on South Africa, presented to Rajiv Gandhi at the United Nations, in recognition of India's contribution

to the struggle against apartheid.

23. Rajiv Gandhi, in New York for the 40th anniversary of the United Nations, holds talks with several world leaders, including President Mohammad Zia-ul-Haq of Pakistan.

24. Athletes P.T. Usha and Shiny Abraham win Arjuna Awards

25. Rajiv Gandhi visits the Hague and meets Dutch Queen Beatrix.

26. Rajiv Gandhi, flying back from a five-nation tour makes an unscheduled stopover in Moscow and meets General Secretary

Stricter Dowry Act Comes into Force

The Dowry Prohibition (amendment) Act, 1984, which makes the provisions of the original act more stringent and effective against offenders came into force on October 2, 1985.

Under the amended act any property or other valuable security given or agreed to be given in connection with a marriage to the bride or bridegroom or any other person will be dowry. It will not be necessary to show that the same was given as "consideration" for the marriage.

Any person demanding directly or indirectly in connection with a marriage any dowry from the parents or other relatives or guardian of the bride or bridegroom will, under the amended act, be punishable with imprisonment for a term, which will not be less than six months, but which may be upto two years and a fine, which may extend to Rs. 10,000.

Also, any person giving, taking or abetting the giving or taking of dowry will be subject to the same punishment as one demanding dowry directly or indirectly and to a fine which may extend to Rs. 10,000 or the value of the dowry, whichever is higher.

However, neither the bride nor the bridegroom, nor persons giving presents to her at the time of marriage will be liable for punishment if the presents are entered in a list maintained in accordance with rules notified in the Gazette of India Extraordinary dated August 19, 1985.

Under the rules the list of presents given to the bride are to be maintained by the bride and those given to the bridegroom by him.

The lists should contain a brief description of each present, its approximate value, the name of the person, who has given it, and where the present has been given by a relation of the bride or the bridegroom, a description of the relationship.

The list will have to be signed by both the bride and the bridegroom or contain their thumb impression. They may, if they so desire, also obtain the signatures of any of their relatives or any other person present at the wedding.

Where the present is made by or on-behalf of the bride or any person related to the bride the present must be of a customary nature and its value should not be excessive having regard to the financial status of the person giving it.

The maintenance by the bride and the bridegroom of the lists of presents is essential. If such a list is not maintained or if any present is not entered in such a list, the persons or person giving and receiving such presents or present will be liable to punishment for giving or taking dowry.

While it is not compulsory, people have been advised to have the lists of presents registered under the Registration Act, 1980.

Mikhail Gorbachev

31 The second dharma sansad organised by the Vishwa Hindu Parishad opens in Udupi

November

1 Petrol tanker explodes on the road near Gulbarga, killing 67.

4 Melattur Balu Bhagavathar dead

5 Preeti Arora retains world arm wrestling title

6 Film star Sanjeev Kumar dead; 82 killed in bus accident in Himachal Pradesh.

10 A clash between people of two castes leaves 12 dead in Munger, Bihar.

11 Prime Minister Rajiv Gandhi dedicates to the nation the Dhruva research reactor at the Bhabha Atomic Research Centre.

13 Over 180 people killed as incessant rain batters Tamil Nadu, Madras City, which received in 48 hours more than twice the average rainfall for an entire season, is almost totally under water. Even Chief Minister M.G. Ramachandran has to leave his residence and move to higher ground.

14 Punjab Governor Arjun Singh and Delhi Lt Governor M.M.K. Wali resign. Andhra Pradesh Governor S.D. Sharma shifted to Punjab. Kumudben Joshi takes his place in Andhra Pradesh. Air-Vice Marshal (Retd), H.L. Kapur succeeds Wali in Delhi. Vasantrao Patil named Governor of Rajasthan; Doordarshan begins teletext service.

15 Arjun Singh sworn in as Union Cabinet Minister for Commerce.

16 70 drowned in Agra boat accident.

17 Acharya Rajneesh returns to India after four years in the United States during which he set up a commune-city, acquired a fleet of 93 Rolls Royces and other riches, dabbled in local politics, remained under a vow of silence for several months, burnt his books and declared his religion, Rajneeshism, dead, got the AIDS scare and put the skids on his wild orgies, quarrelled with his secretary, Ma Anand Sheela, leading to a general mess-up in which everyone pointed an accusing finger at everyone else, was arrested, pleaded guilty to some charges and was finally released and allowed to leave the country; Prime Minister Rajiv Gandhi in Muscat.

19 PLO Chairman Yasser Arafat meets Prime Minister Rajiv Gandhi in New Delhi

22 Rajiv Gandhi visits Lakshadweep

President's Salary Raised to Rs.15000

Lok Sabha approved five bills intended to raise the salary and allowances of the President, Ministers and Members of Parliament, on Dec. 20, 1985.

According to the bills, the President's salary will increase to Rs.15000 from Rs.10000 at present. Rs.30,000 will be the annual pension.

The Salary, Daily Allowance and Constituency Allowance of Union Ministers will be the same as that of MPs. In addition, the PM will get a monthly allowance of Rs.1500, Cabinet Ministers Rs.1000 and State Ministers Rs.500 and Deputy Ministers Rs.300.

Leaders of Opposition parties will get, in addition to the MP's salary, Daily Allowance and Constituency Allowance Rs.1000 as monthly allowance.

According to the revised scale, the monthly salary of the Chairman of Rajyasabha will be Rs.7500. The speaker will get, in addition to MP's salary and daily allowance Rs.1000 as monthly allowance.

The salary of Members of Parliament has been raised to Rs.1000 from Rs.750 at present.

For tax purposes, the value of official residences of Ministers will not be considered.

26. Maharashtra Congress (I) MLA D.B. Kadam's body found in Delhi. He was allegedly beaten to death after he tried to harass a married woman of the locality; Two Indian diplomats injured in attack by Sikh pilgrims in Lahore.

27. Prime Minister Rajiv Gandhi visits Vietnam

28. India and Japan sign a science and technology co-operation agreement in Tokyo. Rajiv Gandhi meets Prime Minister Yasuhiro Nakasone; Subbash Aggarwal scores 1,788 points to set world record in amateur billiards.

29. Three constables sentenced to life imprisonment for murdering Sub-Inspector

George Soman at Panoor, Kerala.

December

3. India wins the Sultan Azlan Shah trophy, beating Pakistan 4-2 in final of the six-nation hockey tournament in Ipoh, Malaysia.

4. On the first anniversary of the Bhopal gas tragedy poisonous gas leaks from a Delhi factory, claiming one life and affecting hundreds; 6 Killed as police fire on rioting fishermen on Marina beach in Madras

7. "Jehova's Witnesses" have to sing the national anthem, rules Kerala High Court

12. Industrialist S.L. Kiroloskar arrested and let off on bail.

14. Prime Minister Rajiv Gandhi joins the leaders of Greece, Sweden, Tanzania, Mexico and Argentina in a teleconference as part of the UN ceremony at which they are honoured with the 'Beyond War award'.

16. Rajiv Gandhi dedicates to the nation the fast breeder test reactor at Kalpakkam.

17. Rajiv Gandhi and Pakistan President Zia-ul-Haq meet in Delhi and agree not to attack nuclear plants in each other's countries; In Adelaide Sunil Gavaskar hits his 31st century and becomes the first man to make more than 9,000 test runs.

18. P.T. Abraham who single-handedly fought the Union Government's discrimination against recruits from Kerala, West Bengal and Tripura compensated for all the losses caused by delay in appointment.

20. Ethiopian leader Mengistu Mariam Haile arrives in New Delhi on a state visit.

24. Prafulla Kumar Mahanta shifts from a university hostel to the Chief Minister's residence after the Asom Gana Parishad secured an absolute majority in the Assam Assembly elections and elected him leader.

28. In Bombay the Congress (I) celebrates the 100th anniversary of the founding of the Indian National Congress.

Indian Science 1985

○ Computers entered the Indian scene in a big way in 1985 which saw significant advances by Indian scientists in the field of energy, health and electronics.

○ Atomic scientists commissioned three reactors, space scientists ground-tested their advanced launch vehicle and farm scientists produced sandalwood in test-tubes.

An Indian-made leprosy vaccine entered field trials on Christmas day and the fifth expedition to Antarctica landed on the icy continent and what is said to be a major advance in basic science, Indian metallurgists produced 'quasi-crystal', a new state of matter.

○ The 40 MW sodium-cooled fast breeder test reactor went critical heralding a new era in the country's nuclear power production programme. The reactor uses indigenously developed plutonium-uranium carbide fuel

○ India's sixth and largest (100 Mw) research reactor 'Dhruva', became critical at Bhabha Atomic Research Centre, Bombay. Another 235 Mw nuclear power reactor was commissioned at Kalpakkam.

○ Indian defence scientists made a significant breakthrough in the development of remote-controlled air-borne vehicles that

could be a forerunners to pilotless fighter aircraft.

○ A cosmic ray detector called Anuradha was carried into space aboard the U.S. shuttle, "Challenger". It returned with vital data that might provide clues to the origin of cosmic rays.

○ The defence scientists developed a wide range of radars incorporating the latest technology for use by the three defence services. These can detect low-flying objects.

○ India's first five Mw magneto-hydrodynamics (MHD) generator was commissioned at Tiruchirappalli. The plant converts coal directly into electricity.

○ The Indian Institute of Science, Bangalore isolated active principles from gossypol, the male anti-fertility agent, first reported by the Chinese.

○ A sandalwood plant was successfully grown from tissue culture at the Bhabha Atomic Research Centre.

○ As insulin-like drug extracted from bitter melon, a common tropical vegetable, may open a new horizon in the treatment of diabetes, said a group of researchers at the University of Rajasthan, Jaipur.

○ Two top Indian neurosurgeons in Madras found that nervous disorders such as epilepsy and depressive psychosis could be satisfactorily treated by non-volitional biofeedback of EEG waves in combination with drugs.

○ A new method for producing alcohol, from sweet sorghum stalks using solar distillation units, was developed at the Nimbkar Agricultural Research Institute, Phaltan, Maharashtra.

○ A 65-year-old Indian invented a device

that helps a man climb the tallest coconut tree in two minutes.

○ A software package for computer-aided analysis and design of ship structures was developed under a joint project of Hindustan Shipyard and the structural engineering research centre, Madras.

○ An Indian Scientist has claimed success in directly generating electricity from plants and also discovered that suitable trees might be substitutable for the conventional roof-top metallic antennas.

International Events

January

1. The worst ever year for commercial aviation — around 2,000 killed — was only a few hours old when a plane crashed into a Bolivian mountainside, killing 29.

13. Train fire in Bangladesh kills over 150.

14. Hun Sen elected Prime Minister of Kampuchea.

15. Brazil elects Tancredo Neves to be its first civilian President in 21 years.

20. Israeli army begins pullout from Lebanon.

26. David Lean's film of E. M. Forster's novel 'A Passage to India' wins 3 Golden Globes at Hollywood.

29. Oxford University votes against honorary degree for British Prime Minister Margaret Thatcher.

February

6. Novelist James Hadley Chase dead; Spanish airliner crashes killing 149.

8. South Korean Opposition leader Kim Dae Jung manhandled at Seoul airport on his return from two years in the United States.

26. Pakistan President Mohammad Zia-ul-Haq dissolves the Cabinet, following the defeat of 6 Ministers in national elections.

March

1. Julio Maria Sanguinetti sworn in President of Uruguay.

3. British miners end their year-long strike; earthquake kills more than 20 people in Chile.

11. Soviet President Konstantin Chernenko dead. Mikhail Gorbachev elected General Secretary of the Communist Party.

12. In Geneva the United States and the Soviet Union reopen arms talks after a chilly

gap of 15 months.

16. Brazilian President-elect Tancredo Neves falls ill and is rushed into emergency surgery hours before inaugural ceremony; International science exposition opens in Tsukuba, Japan.

21. Gen H. M. Ershad claims a Massive mandate to continue as President in a referendum in Bangladesh.

23. About 400 people on two boats drowned in a storm in Bangladesh.

Gen. Mohammad Zia-ul-Haq sworn in President and Mohammad Khan Junejo Prime Minister of Pakistan.

25. Major Arthur Nicholson of the US mission in Potsdam, East Germany, shot dead by Soviet bullet in more than 20 years.

26. Amadeus wins Oscar award for best picture.

28. Singapore President C. V. Devan Nair resigns.

30. Christos Sartzetakis elected President of Greece.

April

6. Sudanese president Jaafar Nimeiri overthrown in bloodless coup. Armed forces chief Abdel Rahaman Swareddahab comes to power.

11. Albanian leader Enver Hoxha dead. He is succeeded by Ramiz Alia.

12. US senator Jake Garn goes into orbit with six others on space shuttle Discovery.

22. Brazilian President-elect Tancredo Neves dead. Acting president Jose Sarney becomes president.

30. American climber Richard Bass, 55, becomes the oldest man to reach the summit of Mount Everest.

May

11. 53 spectators killed in a fire at a football stadium in Bradford, England.

24. Cyclonic storm and tidal waves hit coastal districts of Bangladesh. Thousands perish.

29. Italy's Juventus beats England's Liverpool FC 1-0 in the European cup football final in Brussels after clashes, stampedes and a wall collapse in the stands killed 41 persons and injured about 350.

June

1. Alan Garcia elected President of Peru.

2. Andreas Papandreu reelected Prime Minister of Greece.

5. Mohammad Zia-ul-Haq becomes the first President of Pakistan to visit Bangladesh.

24. Francesco Cossiga elected President of Italy.

30. 39 American hostages released in Beirut more than two weeks after Shiite Muslim gunmen hijacked their TWA Boeing 727 flying from Athens to Rome with 153 persons on board one Passenger was killed and the others were released earlier.

July

2. Andrei Gromyko elected President of the Soviet Union.

4. 125 drowned as ferry sinks in Bangladesh.

6. Robert Mugabe voted back to power in Zimbabwe.

7. West German Boris Becker beats eighth seeded American Kevin Curren 6-3, 6-7, 7-6, 6-4 in the final of the Wimbledon tennis championship to become the first unseeded player to win the title. At 17 he is also the youngest and is in fact younger than the junior champion.

10. The Rainbow Warrior, flagship of the ecological group Greenpeace, sinks after a bomb explosion, in Auckland harbour, New Zealand. One crewman is killed.

13. Emperor Hirohito becomes the oldest of 124 successive Japanese monarchs, crossing the 30,756 days that the 108th Emperor Gomizunoo lived.

15. World women's conference opens in Nairobi.

16. West German novelist Heinrich Böll dead.

18. President Abdou Diouf of Senegal elected chairman of the Organisation of African Unity; Executed former Pakistan

Prime Minister Sulfqar Ali Bhutto's son Shanawaz Khan, 27, found dead at his home in Cannes, France.

19. Dam burst kills 260 in Italy. Johnny the only creature in the world with a lioness for a mother and a leopard for a father, dies at a zoo in Japan, at the ripe old age of 24 — around 112 years in human terms. He was one of seven "leopons" born since 1959. All the others were dead by 1977.

27. Persons, including Mr. Dambar Jang Garung, MP, killed in a series of explosions in Kathmandu;

Telecast worldwide from London and Philadelphia, the 15 hours Live Aid concert raised millions of dollars for famine relief in Africa.

29. Lt Gen Tito Okello sworn in President of Uganda after Milton Obote was overthrown by rebel soldiers.

August

3. Delta Airlines Lockheed Tristar crashes in Dallas, USA, killing 130.

5. Victor Pas Estenssoro elected President of Bolivia.

11. 43rd International Eucharistic Congress opens in Nairobi.

12. Japan Air Lines Boeing 747 crashes near Tokyo, killing all but four of the 52 persons on board; Thomas Sankara, Chairman of the ruling revolutionary council of Burkina Faso, dissolves his Government and sends 19 of his 22 ministers out of the capital Ouagadougou, to work on collective farms.

13. Writer Shiva Naipaul dead.

18. Ferry sinks in China, killing 174.

19. Ali Khamenei re-elected President of Iran.

26. Samantha Smith, the US school girl who wrote to Soviet President Yuri Andropov about her fears of nuclear war and visited the Soviet Union on his invitation, dies in a crash in Auburn, USA.

27. The Government of Maj Gen Muhammad Buhari overthrown in Nigeria, Maj Gen Ibrahim Babangida becomes President.

30. Wee Kim Wee elected President of Singapore;

Over 5,000 spectators in Madrid give standing ovation as he buries his sword in a bull's heart but they freeze into horrified silence as the bull, in a dying spasm, knocks him down and stabs him through the back and holds him

aloft. The previous bull ring death was about a year before this and it was Yiyo who later killed the bull which caused it.

September

1 In London the Observer breaks the news that a secret expedition operating a robot submarine from the US navy ship Knorr had located, some 800 km south of Newfoundland, the wreck of the Titanic, which hit an iceberg and sank on April 14, 1912, taking 1,513 lives, the biggest single transport disaster in history. Those killed included several millionaires and fabulous riches went down with the ship.

2. Representatives of the Kampuchean resistance reveal in Beijing that Pol Pot has retired from the post of military commander of the Khmer Rouge.

8. Zimbabwe Prime Minister Robert Mugabe elected chairman of the Non-Aligned Movement.

11. The International Cometary Explorer, an unmanned US space probe launched on August 12, 1978, and all but forgotten, becomes the first man-made object to pass through a comet. The ICE which took 15 minutes to slice through the tail of the Giacobini-Zinner, sent back valuable data on its position.

16. Olof Palme re-elected Prime Minister of Sweden; More than 100 communist party veterans resign in China, making way for a reorganisation of the administrative set-up.

19. Massive earthquake devastates Mexico City killing around 10,000 people; Italian writer Italo Calvino dead.

22. Prime Minister Laurent Fabius admits, after defence minister Charles Hernu and secret service chief Pierre Lacoste resign, that France sank the Rainbow Warrior.

27. Soviet Prime Minister Nikolai Tikhonov, 80, replaced by politburo member Nikolai Ryzhkov, 55.

30. Four Soviet diplomats kidnapped in Beirut.

October

1. Israeli warplanes bomb the PLO headquarters in Tunis, killing nearly 100 people and wounding another 100. Spy novelist Helen Macinnes dead, Oleg Spirine, one of the four kidnapped Soviet diplomats found dead in Beirut.

2. Film star Rock Hudson dies of AIDS.

4. Two Beirut dailies publish a statement from the Islamic Jihad group saying that US

diplomat William Buckley, kidnapped on March 16, 1984, had been killed in retaliation for the Israeli air raid on Tunis.

8. Floods kill 200 in Puerto Rico.

9. Four gunmen, who hijacked the Italian cruise liner Achille Lauro in the Mediterranean and killed crippled Jewish-American passenger Leon Klinghoffer, surrender to Egyptian authorities at Port Said.

10. Stage and screen star Yul Brynner dead.

11. Egyptian airliner with the Achille Lauro hijackers on board is forced by US fighter planes to land at a NATO airbase in Sicily. The hijackers are arrested by Italian authorities while the plane and the other passengers, including PLO official Abu Abbas, whom the Americans accused of having masterminded the hijack, are released; Film maker Orson Welles who triggered a panic-wave across America with his realistic radio production of H. G. Wells' War of the Worlds in 1938 dies in Los Angeles.

15. 71 Dhaka University students are killed as the roof of a dormitory collapses.

18. Ignoring worldwide appeals for clemency the South African government hangs black poet Benjamin Moloise, 28, for the murder of a policeman.

20. 123 fortune hunters killed as a hillside which they had burrowed into looking for gold, in the Southern Philippines, caved in after rains.

21. The Commonwealth summit at Nassau in the Bahamas strains to reach an agreement recommending limited economic "measures" against South Africa; Vietnam appeals for international aid after Typhoon Cecil left up to 800 dead and thousands homeless.

24. Jose Biro, inventor of the ball-point pen, dead; The Greenpeace protest flotilla fails to stop a French nuclear test at Mururoa Atoll in the South Pacific.

28. Israeli Radio reports that Prime Minister Shimon Peres had a secret meeting with Sri Lankan President J. R. Jayewardene in Paris.

30. Three kidnapped Soviet diplomats released in Beirut.

November

6. Polish communist party chief Wojciech Jaruzelki takes over as President and nominates Deputy Prime Minister Zbigniew Messner to replace him as Prime Minister. Ali

Hassan Mwinyi succeeds Julius Nyerere as President of Tanzania; Aníbal Cavaco Silva sworn in Prime Minister of Portugal.

7. 60 Persons including the Chief Justice and five other judges, are killed as Colombian troops storm the Palace of Justice in Bogota to free it from leftist guerillas who had seized it and held those inside hostage.

9. Garri Kasparov beats fellow Soviet Player Anatoly Karpov 13-11 to become the youngest-ever world chess champion.

14. The Nevado del Ruiz volcano in Colombia erupts, killing 25,000 people.

15. Britain signs an agreement with Ireland, which for the first time gives Dublin a say in the affairs of Northern Ireland.

17. Lon Nol, who was Prime Minister of Cambodia when it fell to communist rebels, dies in California.

19. US President Ronald Reagan and Soviet leader Mikhail Gorbachev meet in Geneva the first superpower summit in six years.

21. It is reported at the international astronomy conference in New Delhi that the French spacecraft Giotto had relayed pictures of the Earth from a distance of 21 million km — the farthest yet — and that the Soviet craft Vega had taped the sounds of a violent storm on Venus; Papua New Guinea Prime Minister Michael Somare loses noconfidence motion and is replaced by Paias Wingti.

22. French secret service agents Dominique Prieur and Alain Mahfart sentenced to 10 years in a New Zealand prison for the sinking of the Rainbow Warrior; Ayatollah Hossein Ali Montazeri to succeed Ayatollah Ruhollah Khomeini in Iran.

25. 60 Persons killed as Egyptian commandos storm an Egypt air plane, hijacked while on a flight from Athens to Cairo and forced to land in Valletta, the capital of Malta. It was the same plane which, while carrying the Achille Lauro hijackers, had been forced

down in Sicily by US fighters.

December

1. Poet and critic Geoffrey Grigson dead.

2. Poet Philip Larkin dead.

3. Assassinated Philippines opposition leader Benigno Aquino's wife Corazon to run for President.

6. The Guinness Book of Records enters its own name as the biggest selling copyright book.

8. Poet Robert Graves dead.

9. Vinicio Cerezo elected President of Guatemala; Former Argentinian President Jorge Videla sentenced to death.

10. Dr. Yevgeny Chazov and Dr. Bernard Lown, founders of International Physicians for the Prevention of Nuclear War, the organisation which won the year's Nobel peace prize, together save the life of a reporter who suffered a heart attack at a news conference on the eve of the award ceremony in Oslo. The US ambassador keeps off but the Soviet ambassador attends the ceremony for the first time in 10 years. Protestors brave the cold to demonstrate against giving the award to a Soviet official.

12. Chartered airliner carrying 250 US military personnel from the Sinai peacekeeping force and a crew of 8 crashes in Gander, Canada, killing everyone on board. In Beirut an anonymous caller tells a western news agency that the Islamic Jihad planted a bomb on the plane; New Zealand claims 11 million dollars from France for the sinking of the Rainbow Warrior.

23. Jailed South African leader Nelson Mandela's wife Winnie released in Johannesburg after being arrested and held overnight.

25. Cartoonist Joseph D. Oriolo, who created "Caspar the friendly ghost", dead.

30. Marshal law lifted in Pakistan.

World Science 1985

□ Two astronomers claimed to have detected the most distant galaxy, at a distance of 14.5 billion light years from the Earth.

□ The first close encounter between a spacecraft and a comet took place when the U.S. International Cometary Explorer passed through the tail of the comet Giacobini-Zinner, within 8,000 kilometers of the comet's nucleus.

□ A compound, the first of a new type "quasicrystal" discovery. Against crystal which consist of the repetitive arrangement of a single unit cell, the new compound consists of two unit cells arranged in non-periodic fashion.

□ Excitement was generated due to part success at enabling nuclear fusion reaction to take place with the help of particles called

muons and without needing the very high temperatures required in earlier experiments. Nuclear fusion reactors might one day become a principal source of energy for the world.

□ Scientists created a 650-hectare mega-fire in the Canadian forests. The aim was to check, on a small scale, whether the smoke and soot would block out sunlight to the extent predicted by models of nuclear winter following a nuclear war.

□ Scientists extracted DNA from a year-old Egyptian boy mummified around 400 B.C. and reproduced it in tissue culture.

□ With the successful transfer of a piece of human DNA into petunia, for the first time a mammalian gene has been transplanted into plants. The alien gene has also been found to lead to the manufacture of its associated product.

□ The first fully-detailed image of a virus was published. The structure of the particular virus, which is also responsible for the common cold, was found to be such that a vaccine against it may not be easy to produce.

□ The world's first mechanical neurosurgeon—a robot—took part in an operation to remove a brain tumour from a cancer patient.

□ Karen Ann Quinlan, an American woman who lapsed into a coma in 1975, died after slightly more than a decade in a "chronic vegetative state". Her condition prompted a historic decision by a U.S. court in favour of the right-to-die of terminally ill patients.

□ A significant difference has been discovered in the corpus callosum area of the brains of left- and right-handed people.

□ A new technique for obtaining the "genetic fingerprint" of a person has been used for the first time to resolve a dispute about the

maternity of a child.

□ Early warnings of heart attacks can now be provided by a new pocket-size device consisting of an electrocardiograph, a tiny computer and electrodes for hooking up to the patient. An alarm gets triggered whenever the heart-beat changes dangerously and the computer memory records the heart activity for later diagnosis.

□ For benefitting handicapped persons, a typewriter operated by eye-sight was launched in the U.S. market.

□ Based on the fact that the resistance of skin on the palms of the hands and soles of the feet rises with increasing drowsiness, a doctor has invented an alarm system that can wake people up whenever they fall asleep.

□ A new radar safety device, small enough so it can be held in the palm of one hand, can warn speeding motorists of impending collisions. The manufacturers are now working on a version that will automatically brake a car whenever a collision seems imminent.

□ With two entry ports, a new Japanese-made video cassette recorder enables easy duplication of pre-recorded programmes. Until now this had to be done with the help of two VCRs.

□ Billions of polystyrene spheres of 10 micrometers diameter became the first space-made product to be put on sale. They can be utilized as standard references for scientific and industrial purposes.

□ The U.S. National Aeronautics and Space Administration has scheduled the launching of America's first commercial space platform (dubbed the "Industrial Space Facility") for 1989.

□ Scientists developed a new method of cancer treatment in which the human body's own immune system can be used to destroy cancer cells.

132. WHO'S WHO IN INDIA

Union Government

Zail Singh: President

R. Venkataraman: Vice-President.

Cabinet Ministers

Rajiv Gandhi: Prime Minister, Defence, Sci-

ence & Technology, Personnel and Administrative Reforms, Planning, Environment and Forest

Buta Singh: Agriculture and Rural Development

Vasant Sathe: Energy

Baliram Bhagat: External Affairs

V. P. Singh: Finance
 Mrs. Mohsina Kidwai: Health and Family Welfare
 S. B. Chavan: Home Affairs
 P. V. Narasimha Rao: Human Resources Development
 N. D. Tiwari: Industry
 Ashoke Sen: Law and Justice
 H. K. L. Bhagat: Parliamentary Affairs
 A. B. A. Ghani Khan Chowdhary: Programme Implementation
 K. C. Pant: Steel and Mines
 Bansilal: Transport
 Abdul Gafoor: Urban Development
 B. Shankaranand: Water Resources
 P. Shiv Shanker: Commerce

Ministers of State

(Independent charges)

Ram Niwas Mirdha: Communication
 P. A. Sangma: Labour
 Chandrasekhar Singh: Petroleum
 Mrs. Rajendra Kumari Bajpai: Welfare
 Khurshed Alam Khan: Textiles

Ministers of State

Sukh Ram: Defence Production and Supplies
 Arun Singh: Defence Research and Development Organisation
 Shivaraj Patil: Science and Technology, Ocean Development, Atomic Energy, Electronics
 P. Chidambaram: Personnel Administrative Reforms
 Ajit Panja: Planning
 Z. R. Ansari: Environment and Forest
 Yogendra Makwana: Agriculture
 Natwar Singh: Fertilisers
 Arif Mohammad Khan: Power
 K. R. Narayanan: External Affairs
 Janardan Poojari: Banking and Insurance
 S. Krishna Kumar: Family Welfare
 Arun Nehru: Internal Security including Police, Rehabilitation and Law and Order
 Mrs. Suseela Rohatgi: Education and Culture
 Mrs. Margaret Alva: Youth Affairs; Sports
 R. K. Jaichandra Singh: Chemicals
 M. Arunachalam: Industries
 H. R. Bhardwaj: Law and Justice

Ghulam Nabi Azad: Lok Sabha
 Sita Ram Kesari: Rajya Sabha
 Mrs. Ram Dulari Sinha: Mines
 Madhavrao Scindia: Railways
 Rajesh Pilot: Transport
 Jagdish Tytler: Civil Aviation
 Dalbir Singh: Urban Development
 V. N. Gadgil: Information and Broadcasting

Deputy Ministers

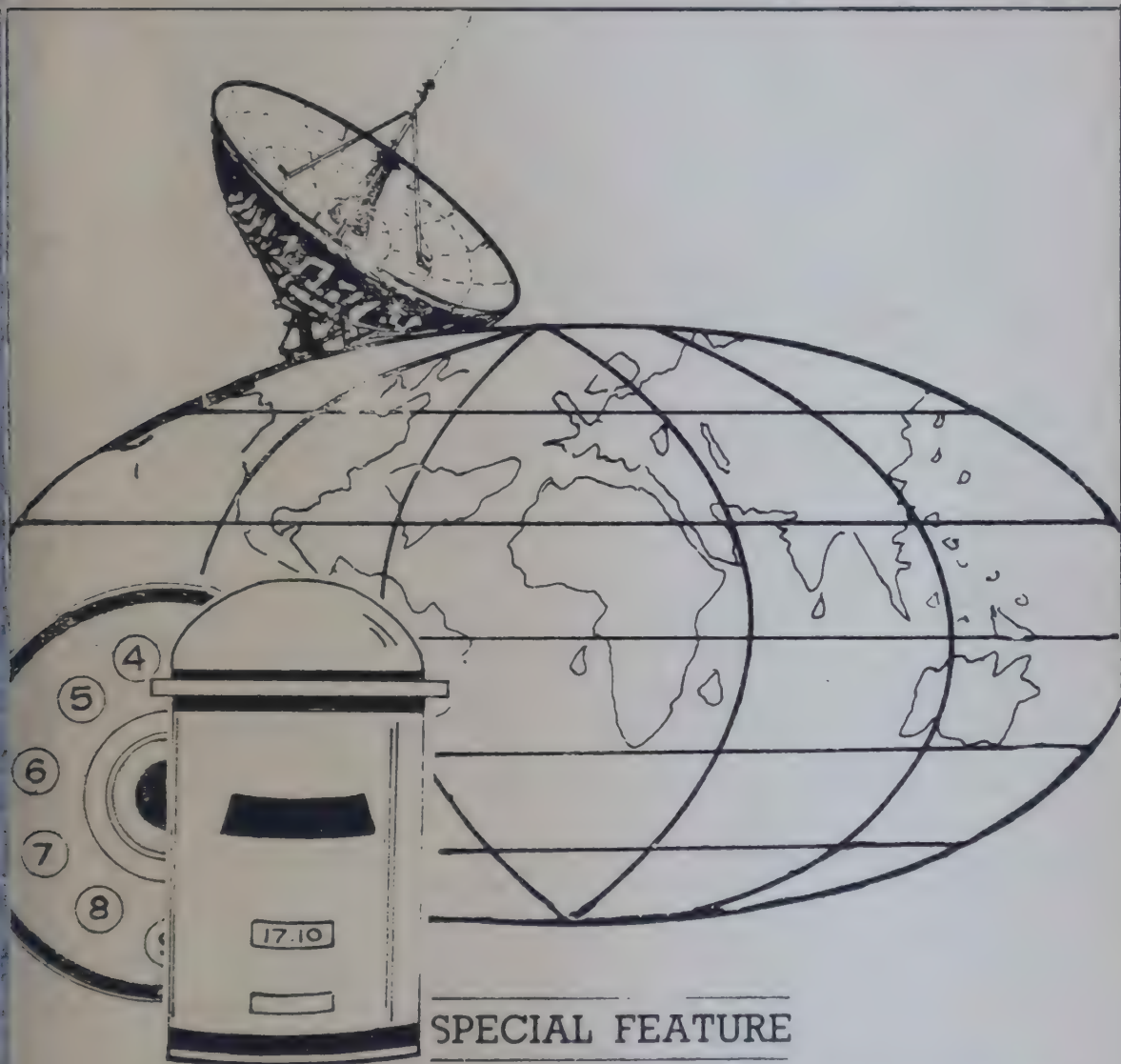
Giridhar Gomango: Welfare

Chiefs of Armed Forces

President Zail Singh: Supreme Commander
 Gen. K. Sunderji: Chief of the Army Staff
 Air Chief Marshal: Antony la Fontaine: Chief of the Air Staff
 Admiral R. H. Tahliani: Chief of the Navy Staff

Heads of Important Offices

Speaker, Lok Sabha: Balram Jakhar
 Dy. Speaker Lok Sabha: Thambi Durai
 Chairman, Rajya Sabha: R. Venkataraman
 Chairman, Planning Commission: Rajiv Gandhi
 Dy. Chairman, Planning Commission: Mahesh Mohan Singh
 Chief Election Commissioner: R. V. S. Prasad
 Chief Justice of India: P. N. Bhagwati
 Chairman, Law Commission: K. K. Mathew
 Chairman, Monopolies and Restrictive Trade Practices Commission: S. Madhusudan Rao
 Chairman, Atomic Energy Commission: R. V. Ramanna
 Governor, Reserve Bank of India: R. L. Malhotra
 Chairman, Space Commission: U. R. Rao
 Chairman, U.P.S.C.: H. K. L. Kapoor
 Chairman, Minorities Commission: M. H. Beg
 Chairman, University Grants Commission: (Mrs.) Madhuri Shah
 President, Indian Olympic Association: Vidya Charan Shukla
 Attorney-General of India: K. Parasaram
 Comptroller and Auditor-General of India: N. Chaturvedi
 India's Permanent Representative at U.N.: Krishnan



SPECIAL FEATURE

COMMUNICATION 21ST CENTURY

M. A. Chowdappa

Director (Satellite) P&T

India has jumped into the bandwagon speeding towards the 21st century by initiating a costly project for communication revolution. With the INSAT sending the beacon light from the stars, we are entering an era of electronic mail, electronic banking, electronic news dissemination, videotex, audio and video conferencing, visual communication—an era of *Integrated Services Digital Network*.

Communications technology is evolving rapidly. There have been a number of inventions and developments to provide the ever increasing types of communication ser-

vices. By communications, we mean all types of services which render communication between man and man, man and machine machine and man and machine and machine. These may range from the traditional postal

service, print media, radio and TV broadcasting, facsimile communications, data and computer communication, to newer services such as Electronic Mail, Electronic Banking, Electronic News Dissemination, Videotex, Audio and Video Conferencing, Visual Communication and so on.

The technologies to provide these services are mostly available and are evolving. Demands also are growing for new services. Perhaps, cost is the only constraint as developing countries have other priorities.

Five Eras. The communications revolution can be distinguished by four or five eras, the first one being the era of language which spanned over a long time. With the development of writing, written communication started but remained among a privileged few. However, the third era started by the print media brought about a revolutionary change with publication of books, periodicals and newspapers. The fourth era began with the postal service, telecommunications and broadcasting which fostered interactive as well as one way communication.

The fifth era which is in the evolutionary state is the result of merger of computers, communications and information technology to achieve what is called "*one world—one network*".

The technologies responsible for such a network, are the digital technology, computers, optical fibres and satellite communications. The fillip to the development of such a telecommunication network, appropriately called *Integrated Services Digital Network*, or ISDN by CCITT (International Consultative Committee for Telephone and Telegraphy) is no doubt due to the explosive growth of information products needed by government, Business and Industry for which separate networks for each kind of services are being built. But with the advancement of technology, all services are expected to be provided by one network called ISDN. These networks are also known as *Information Network System* (INS) in Japan and *Telematique* in France.

Types of Services. In the interactive mode of services, the postal, telephone and telegraph services dominate for the use of general public. For the business and industry

in addition to the above, facsimile, data and telex communications are being provided in almost every developed and developing countries. The newer interactive services being visualised are numerous such as teletex, videotex, electronic banking, teleconferencing, video conferencing, etc.

In the one way communication services, Radio and TV broadcasting stand out. The other one way services possible are, teletext, electronic news delivery, etc. The new services are briefly described below:

Facsimile Communications or Telefax is meant for transmission and reception of documents, charts, graphs, etc. from one location to another by electronic means. Depending on the speed and clarity desirable channels of different speeds are employed for transmitting the documents. Table below gives the time taken and speed of the channel for transmission of A4 size document.

Facsimile Channels

Type of Facsimile	Time Terminal Minutes	Speed of Channel Kbps*
Group 1	6	2.4
Group 2	3	4.8
Group 3	1	9.6
Group 4	10	48

* Kbps: Kilobits per second.

Data and Computer. Data terminals can interact with Computer through leased or switched data channels, or computer can communicate with another computer for bulk data or file transfer. The terminals have been built to operate at different speeds depending on the applications.

For inquiry and response, a slow speed terminal of 300 bits/Sec can be used and hooked to the telephone network. Terminals of higher speeds require dedicated switched channels. Industry standards have been evolved regarding speeds of channels as that of facsimile channels.

Teletex. This is an interactive service for transmission and reception of messages. Teletex terminals, linked to a Computer, stores and forwards the messages to the addressed terminal. The terminal can communicate

act for any messages, just as the messenger reaches the mail box. Teletex standards are being evolved by CCITT. There are many networks operating such as *OnTyme*, *Telemail*, etc.

While teletex would be an improvement over Telex, a formal electronic message system is expected to have message processing facilities before and after delivery. These could include composing, editing, proofreading, formatting, addressing, approval from superiors, reading incoming messages in any order, maintaining on-line message files and retrieving old messages.

The word processors forming an element of office automation can be elevated to serve Messaging Service with communications added to it. This could be called a personal message service but a generalised electronic message service involving a number of persons in an office needs a further definition.

Videotex is an interactive system capable of displaying text and graphics in colour and black and white on a television screen linked to a decoder unit. Through a telephone, link is established to a data-base storing information of interest, such as Rail and Air reservation information, hotel reservation, theatre programmes, etc. and information of choice is retrieved by following the indexing procedures. The data-base could be one or many connected to the telephone network. A number of networks are in various stages of implementation with brand names as indicated in Table below:

Videotex Services

Name	Country
Prestel	Britain
CAPTAIN	Japan
TELIDON	Canada
Teletel	France

Videotex systems emphasise information retrieval systems, from several data bases connected to the network. One of the largest bases connected is the listing of more than 20 million telephone subscribers of the French telephone network in the data base. The subscriber, through this service can obtain telephone number of any of the subscribers and the need for telephone directory has almost vanished. Millions of calls are being

Electronic Banking

With the introduction of electronic banking for business, there will be no need to go to bank for transactions such as withdrawal or depositing of funds, to acquire market information of bonds and securities which can now be done through communication lines and banking terminals.

The Finance Manager can get an up-to-date position of cash-flow almost instantly. Electronic Banking for firms and business can be introduced with suitable steps in automation (or computerisation) in both the banks and firms.

However, certain services such as Financial Statements, quotation service, cash management service, etc. can be started without waiting for automation and a fullfledged electronic banking would be possible when office automation is achieved in banks and firms.

Home banking is a distant possibility and its need or otherwise depends on the cost effectiveness. But with the growth and establishment of ISDN (Integrated Services Digital Network) opportunity will be available for introduction of such services at marginal cost.

placed to obtain the telephone numbers through the Videotex terminal. This Videotex services has encouraged in the linking of more than 1000 data bases to the telephone network by information providers.

Videotex is presently intended for information retrieval from a data-base. For example, one can have access to another Videotex terminal of interest and pass messages by suitable communication procedure and can pave the way for electronic mail.

Electronic News. Videotex terminals has also the potential to receive the electronic news. Just as radio, TV and Newspapers receive the news, snippets, etc. from news agencies and wire services, the same can also be accessed by the Videotex users.

With escalating costs of newsprint a situation may arise for the development of electronic home delivery of news, information and advertising, as an alternative.

In the Indian situation the potential for newspaper circulation has not saturated. There is demand for simultaneous publication of newspaper editions from all major state capitals. The satellite communication media can prove quite effective in transmitting the formatted pages to a number of locations in a broadcast mode for simultaneous publishing.

Conferencing Services. These services are aimed at minimising frequent travel for business, specially with increased cost of travel. Besides, the time taken in travel is also an inhibiting factor which otherwise can be used for productive purposes.

Audiographic Conferences have been found quite successful enabling discussion among several participants with data and graphics displayed simultaneously. This will not occupy much band-width which is a scarce resource. In any case, the audio and graphics are very essential elements for discussion and as such deserves its exploitation.

Video Conferencing brings in full motion picture but requires large bandwidth and would be costlier several hundred times the audiographic conferencing. But with introduction of satellite communications, Video-Conferencing can become quite effective because of broadcast nature and cost being insensitive to distance. Yet bandwidth would still remain a limited resource even if it becomes cost-effective. But video conferencing is expected to be useful where an expert's time of travel for an interchange is considered to be costlier than the communication.

Visual Communication. Bell laboratories developed video telephone some years ago but the demand did not pick up because of the high cost and also because of societal factors. Viewing and talking to a distance and being viewed creates a new situation and acceptance of such service, even if the cost problems can be solved, requires to be tested by social scientists.

The solution for the cost of bandwidth

which prohibitively high appears to be in sight with the development of optical fibres. It is not only the video telephone service which requires large bandwidth, an interactive service like the wideband videotex to obtain colour moving picture of interest from a database, also needs large bandwidth. While business firms may be connected by such wideband services and may afford such visual communication, video conferencing and wideband video tex services, the extension of such services to homes may have to wait till other priorities are fulfilled.

Paging Service. When someone is expecting to receive messages but cannot wait near a telephone, the best thing to do is to provide him a pocket-sized receiver.

This receiver can be selectively activated from a base station so that he can reach the nearest telephone and talk to his contact address. This is a very popular and useful service to call the doctors in emergency and business executives, VIPs, etc.

Necessity arises to communicate while moving. Cellular Radio systems have been developed so that the moving vehicles are heard or talked to within a cell by the base station and transferred to the next cell automatically. Such services are expected to be of use to Businessmen, Taxis and Police who have to be on the move and yet require communications.

While the radio and TV broadcasting have covered large populations even in the developing country, certain new low cost services are evolving. Broadcast teletext is one such service to distribute information of widest choice.

Radio Broadcasting. Thanks to the cheap transistor, Radio broadcasting is the only broadcasting service achieving about 100% coverage. Before the INSAT, the picture of radio networking was different. The radio stations had the choice of generating their own programmes (not all are equipped with production facilities) or pick up off the air or receive programmes through the terrestrial microwave or coaxial systems specially to broadcast the national programmes and regional programmes.

INSAT has brought about a sea change by providing high quality radio networking

channels to the transmitting stations to pick up national and regional channels as per the programmes drawn up. While this has met the needs of AM broadcasting, FM broadcasting continues to be localised to a few centres and interconnection of these stations would necessitate high quality stereophonic channels either through satellite or through microwave, coaxial systems.

TV Broadcasting. TV broadcasting which started as an experimental setup in 1959 has grown into a network of more than 180 transmitters covering more than 70 per cent of the population. All these transmitters are equipped for colour transmission.

While coverage extends to 70 per cent population, it would take a long time for TV to reach all those in the TV coverage zone. Firstly the demand for TV sets has to be satisfied for all those in a position to buy, and secondly viewing opportunity to be given through community sets to those not in a position to get one.

The next stage of development, most difficult and most crucial, is the remaining 30% of the population dispersed over a wide geographical area, the 70% coverage having concentrated on cities and towns and the surrounding villages. The remaining 30% are the villages for whom rediffusion may or may not be cost effective and other techniques may have to be evolved.

Channels. Besides building the network, there is a limitation on the number of TV channels. A national channel, regional channel and local channel at least would be required but even this would need a lot of investment. But the need for more national and regional channels particularly for adult literacy and open university education is being felt more strongly.

This may remain a distant dream, due to cost factors. There is a limit for off the air channels because of limited frequency resource. Many countries are considering delivering programmes through wideband coaxial or optic fibres so that the subscribers can retrieve programmes of their choice. Such schemes may be available to those who also will want other wideband services such as visual communications and broadband videotex.

Hold the Call, Call Another

The telephone voice as well as video are analogue signals that have a band of frequencies to be transmitted or switched. The declining costs of integrated circuits, savings in multiplexing and switching costs in comparison to analogue switching and transmission are largely responsible for use of digital techniques.

As a result of this, we have a single network capable of handling all types of services. Digital signals are more amenable to scrambling, multiplexing/demultiplexing coding for error free transmission, speed and protocol conversions in order that multiplicity of services are possible.

The digital switching exchanges can offer an amazingly large number of facilities to the telephone user depending on the software built into the system. These could be holding the call to dial to another number, and then return to the interrupted call, setting up conference facilities, call waiting when the called number is actually busy, and both the called and calling parties are signalled of the status, call forwarding, abbreviated dialling, automatic call transfer in the event of the number being busy to a designated station, etc.

With such a potential application, the digital technology has paved the way for building the integrated digital network as a precursor to the integrated digital services network.

Direct Broadcasting. We already have two direct broadcast channels so that small community sets can receive the programmes. The satellite can add a few more channels and would serve the purpose of national channels and regional channels on a time sharing basis. However, difficulties would still arise for prime time viewing of any programme anywhere, and limited number of such channels would be possible through satellite.

Transmission of written documents is an

important requirement in business. Signed instructions wherever required for taking urgent action is accomplished by these terminals. CC ITT is defining the standards of telewriting and experimental services by genetic names in various countries have started as shown in Table below:

Telewriting

Sketch phone	Japan
Display phone	USA
Scribo phone	Holland
Teleboard System	France

It is difficult to indicate an exhaustive list of services possible on a modern communication network. A large number of services such as Teleshopping, Remote medical care, Data broadcasting, Data collection, Remote metering services, are in development.

Communication Services. Telephone, Videophone, Sound broadcasting, Television broadcasting, Text broadcasting, Telegraphy, Electronic Mail, Facsimile.

Voicegrams (Voice messages), Electronic Banking, Music selection, Video selection, Radio paging, Mobile Telephone, Computer communication.

Remote access of computer, Real-time reservation systems, Dialogue with voice answer back, Video-Tex, Data Collection Systems, Telemetry, Remote meter reading, Data broadcasting.

Audiographic Conferencing Video-Conferencing, Interactive Television (Games/Shopping), etc., Computer Assisted Instruction, Library Services, Remote Meter reading.

Technology Issues. Switching: Presently India has about 3 million telephones served by nearly 7000 telephone exchanges. These exchanges can be grouped into large exchanges (5000-10000 lines) in the major cities, medium exchanges (200-2000) in large towns and rural exchanges (10-200) in rural and small towns. About 90 per cent of them is automatic and the remaining are manual lines. National subscriber dialling facility is not yet extended to all the exchanges and not all exchanges are yet automatic.

Bulk of the automatic exchanges are electro-mechanical type and stored programme control analogue electronic exchanges were

introduced just a few years ago. Shortly thereafter a further step has been taken to introduce computerised digital local exchanges and digital trunk exchanges which would pave the way for integrating all the variety of services we have discussed earlier.

Transmission. The next most important component in the network is the transmission link. In the sixties, coaxial and microwave links were established to modernise the transmission network. This facilitated the growth of national subscriber dialling as well as the Telex network and leased data and facsimile channels and private networks. The types of system, their capacities, are indicated in Table below:

Transmission Links

Coaxial Links

Sl. No.	Cable-size	Capacity Voice-channels
1.	1.2/44, 2.6/9.5	300
2.	1.2/44, 2.6/9.5	960
3.	2.6/9.5	2700
4.	2.6/9.5	10800

Microwave

Sl. No.	Frequency MHZ	No. of Radio Channels	Voice Capacity/ Radio Channel
1.	2.1 - 2.3	12	120,300
2.	3.8 - 4.2	6	960, 1200, 1800
3.	5.925 - 6.425	8	1800
4.	10.7 - 11.07	12	1800
5.	7.425 - 7.725	6	300

Satellite Media. Besides the coaxial and microwave links, the satellite media was introduced in the domestic network in 1982. The domestic network of INSAT-1B has a capacity of about 4000 circuits and has been integrated with the network through 28 fixed earth stations. Many more will come up in the next few years to utilise the INSAT-satellite.

With the introduction of satellite, a new dimension has been added in the network facilitating high usage long distance routes and remote locations to be brought on line.

satellite media. This media will act in a complementary role to the terrestrial media in routing the traffic.

Satellite media is not only used for the telephone network, it has provided direct TV broadcasting, Radio networking channels, Meteorological services, Disaster Warning service, etc. This is the first multi-purpose satellite in commercial use in the world.

Satellite media is expected to take the lead in building point to multi-point networks for news agencies, news paper publishing, which can be more easily and effectively implemented on Satellite.

Optical fibre links. High purity silica fibre of 5 micrometer diameter has amazing characteristics of low loss at optical wavelengths and can be exploited for transmitting high capacity digital information over a length of 20-25 KM without repeaters.

The first link in India was provided for junction network in a multi-exchange area of a city. Some links are under construction and in the Seventh Five-Year Plan, it is expected that a number of major cities would be linked by this modern and high capacity digital link.

Optical fibre has three distinct roles to play in achieving integrated services.

Distance Network. For achieving national dialling the channels required among some of the routes like Bombay-New Delhi could run into a few thousands. There are a number of such high density routes. To achieve such a large capacity of channels, part of the capacity would have to be borne by optical fibres and part by coaxial, microwave and satellite media. This is to ensure minimum loss of traffic in the network in case of any problem with one of the routes.

Junction network. Our large cities are becoming a network of several local exchanges reaching figures of 50 or more. The interconnection among them are being provided by Vicegrade cables. Capacity of these are being increased by using 24 or 30 channel Pulse Code Modulation Systems (PCM) when requirement arose for more junctions. This step is cheaper than laying new cables. But these PCM systems require repeaters at every 2000 m for regenerating the digital signals.

Radio links have been adopted for junction working. But frequency is a limited resource, and with continued growth, new media became necessary, optical fibre fills the gap admirably with repeater distances of 20 km or more it links at the existing centres of local exchanges without repeater. Its capacity is unlimited being a guided medium unlike Radio links.

Subscriber Cable. The present practice is to use voice grade cables upto a point and extend it to the subscriber telephone through a field cable. While this would be feasible in large cities, extension on cables in towns and rural areas may continue to pose problems because of long subscriber connections from the exchange and such needs may depend on copper cables. Metallic cables having long loops would not be suitable for digital transmission. In such cases, optical fibres in bundles of 100 or 200 can be laid to reach the subscriber, at least businesses and industry in order to meet requirement of digital channels.

The terminal equipment of various capacities are available for varied applications discussed above. The following table gives some characteristics and capacities.

Optical Fibre Systems

Wave-lengths Nanometre	Bit rate Mb/s	Fibre type	Voice grade channels
850/1300	2	GI	30
850/1300	8	GI	120
850/1300	34	GI	480
850/1300	140	GI	1920
1300	140	SM	1920
1300	565	SM	7680

GI: Graded Index Fibre; SM: Single Mode Fibre.

Research is going on to develop 1.6 G bit/Sec systems having capacity of 23000 channels per fibre pair.

Digital Coaxial. Coaxial cables which have been laid already and working with analogue systems can be converted to digital transmission systems. Where new cables will be laid, digital systems only will be installed.

However, coaxial cable systems need much shorter repeater spacings than optical fibre systems and would require more duct space because of their larger size. And it therefore seems that optical fibres appear to

have distinct edge on coax cables. Table below gives the coaxial systems developed.

Coaxial Cable Systems

Type of Cable	Repeater Spacing	Bit rate M b/s	Voice Channels
1.2/4.4	1 km	140	1920
2.6/9.5	2 km	140	1920
2.6/9.5	1.5 km	565	7680

Digital Microwave. To meet the goals of IDN the digital microwave systems are going to play an important role. The nation-wide analogue systems which served its life can be replaced using digital schemes making use of the towers and buildings which have much longer life than the equipment. The frequencies and the capacities of the microwave systems are shown in the table.

Satellite Technology. With the launch of Early Bird (INTELSAT I) in 1963, the satellite communication era can be said to have begun. The explosion in the satellite technology was unprecedented with its application, not only for international communication but also for regional and domestic communications. Not only is the frequency a limited resource, the geostationary orbit is also a very limited resource.

Even if improvements are made in the

ground stations, new techniques are adopted in access techniques, there can only be 180 satellites with the proposed 2° spacing between the satellites. But the land mass is not uniformly distributed and new techniques have to be evolved to utilise the full 360° arc. Thus the need for higher frequencies for satellite communications arise. With various access techniques, high frequencies, the potential for growth is substantial provided there is international agreement on the equitable sharing of the resources. Such coordination and planning efforts are the concern of world administrative radio conferences held periodically. For example, plans have been made by allotting the locations for direct satellite broadcasting of TV. Some of the typical frequencies employed for Satellite Telecommunications and Broadcasting:

Satellite Frequencies

Frequency GHz	Usage
1.5/1.6-6/4	Maritime communication
2.5	Broadcasting
6/4	Telecommunications
14/12	Telecommunications
30/20	Telecommunications
12	Broadcasting

Non-Voice Services. Although the telephone traffic is still the largest volume o

Digital Microwave Links

Sl. No	Frequency band GHz ₂	No. of radio channel Normal + Standby	Channel band width MHz	Capacity MB/s	Voice grade channels per bearer
1.	2.110-2.30	11+1	7	32	480
2.	3.6-4.2	6+1	40	200	2880
3.	4.4-5.0	6+1	40	200	2880
4.	5.925-6.425	6+1	40	200	2880
5.	6.430-7.110	6+1	40	200	2880
6.	10.7-11.7	11+1	40	100	1440

Note: GHz : Gaghertz : 10⁹ Hz
MHz : Megahertz : 10⁶ Hz
Mb/Sec.: Megabits per second = .10⁶ bits/Sec

traffic handled by Telecommunication network, non-voice traffic continues to grow in a big way. The non-voice traffic which is being met by leased lines, for data and facsimile are not adequate to meet the variety of applications as already discussed.

The digitalisation of telephone network purely from economic and network flexibility has opened up a vast opportunity for non-voice services. It has been recognised that end to end digital service is so vital to the industry and business to link their data processing facilities.

The data traffic per subscriber being bursty in nature provision of leased lines would be very expensive since the channel is occupied for a very short time. Therefore, new techniques like packet switching for bursty traffic and circuit switching for steady traffic are the answers.

Computers. The computers are progressively reaching every sector in view of their ever increasing data processing capacities, speed of computation, information storage and retrieval and declining costs. The applications are endless, and despite apparent fears of its adverse impact on employment, there is a growing trend of computer applications and its numbers.

The computers classified as super computers Maniframers, minicomputers and microcomputers are estimated to reach the following figures according to recent studies by the end of Seventh Five-Year Plan.

Growth potential of computers

Type	No.
Super Computer	30
Maniframer	100
Minicomputers	300
Microcomputers	100000

A good number of these computers would be installed in large organisations like Railways, Telecommunications, Banking Sector and Public Undertakings which have units spread over the length and breadth of the country. Therefore, their interlinking through communication lines and with switching facilities would become necessary. Thus the era of computer communications to meet the interconnection either as dedicated private

Office with No Paper!

The Office of the future will not depend any more on paper work as the paper would be too expensive and retrieval of information costlier and slower. There are compelling reasons, for computerized data storage and retrieval in large organisations and government as well as automatic office procedures wherever possible.

The office automation is aimed at the improvement of office productivity and sufficient research is required to identify suitable products. Word processor, for example, is one such. With communicating facility added to it, the mail can be sent electronically.

However, as already discussed earlier electronic message systems are still a distant goal as sufficient research is needed for automating the work of a number of persons handling variety of works in an office and again its introduction and growth depends on a number of factors such as the growth of IDN, cost factors associated with the present labour intensive office system as against the cost of automated or semi-automated office.

networks or through a public switched network is expected to make a beginning.

Integrated Network. We already discussed the variety of services required to be provided in an information-oriented society. For economic reasons and for flexibility, the Telecom Administrations have decided to change over to digital switching and transmission. They are building initially 64 Kbps circuit switched network for telephone traffic and packet switched network for signalling, tariff, network control and management.

These networks can take on all kinds of narrowband non-voice services such as Telex, Teletex, Electronic Banking or Computer Communications. While these networks are already working using analogue channels or digital channels as the case may be, they are slowly expected to be inte-

Direct Telecom Gateways

● Bombay

Via Satellite

1. Australia, 2. Bahrain, 3. Bangladesh, 4. Burma, 5. France, 6. Germany, FRG, 7. Greece (Yugoslavia), 8. Hongkong (Taiwan), 9. Indonesia, 10. Iraq, 11. Italy (Germany-GDR), 12. Japan, 13. Kenya, 14. Kuwait, 15. Malaysia, 16. Netherlands (Belgium), 17. Nepal, 18. Nigeria, 19. Oman, 20. Pakistan, 21. Philippines, 22. Qatar, 23. Romania, 24. Saudi Arabia, 25. Singapore (Philippines), 26. Spain (USA), 27. Sri Lanka, 28. Switzerland, 29. Tanzania, 30. Thailand, 31. U.A.E., 32. U.S.S.R. (Afghanistan), 33. Yemen PDR, 34. Zambia, 35. U.K., Belgium, Canada, Czechoslovakia, Egypt, Sri Lanka, Switzerland, Tunisia, Netherlands and USA.

Telecom links as on 31-12-1984.

● New Delhi

Via Satellite

1. Australia, 2. People's Republic of China, 3. France (Cuba, Italy, USA), 4. Germany FRG (Australia), 5. Hongkong (Indonesia, Japan), 6. Iran, 7. Japan, 8. UAE, 9. UK, Belgium, Canada, Denmark, Egypt, Sweden, USA, USSR

Via Troposcatter

1. USSR

Via H.F.

1. Afghanistan, 2. USSR

● Madras

Via ICOM Cable

1. Malaysia, Australia, Canada, Hongkong, Singapore, and USA

● Calcutta

Via H.F.

1. Burma, 2. Hongkong, 3. Vietnam

grated with the digital switching networks being set up by the Telecommunication Administrations realising the goal of narrow-band ISDN.

In the Indian context, the goal of IDN and ISDN are yet to be established but considering huge investments involved one can expect the growth of IDN through the next two plans in which nationwide digital switching and transmission systems would be established for meeting the new demands as well as replacing substantial part of analogue systems. Simultaneously the telex, telefax and packet switching networks, etc will grow separately to meet the non-voice demands.

One can expect that the non-voice networks progressively brought on to the IDN in the 9th five-year plan making a beginning of ISDN. A full fledged narrowband ISDN could be expected to be realised by end of 10th five-year plan. With the growth of ISDN, implementation of leased channels or private networks would become quite flexible and easy to handle.

Terminals. To meet the variety of demands the terminals required are numer-

ous such as the Telephone, Teleprinter, Keypad video screen, printers, computer terminals, Electronic Private Branch Automatic Exchanges (EPABXs), (local area network (LAN), facsimile terminal, Data terminals, etc.

The purpose of ISDN is not only to provide services with common switching and transmission and signalling systems, it is to open up the possibility of communication of dissimilar terminals, through protocol, code or speed conversion which are easily accomplished with digital techniques.

Appropriate Technology. India and other developing countries face a dilemma whether or not to modernise their industrial base. Suggestions are made for appropriate technology to suit the countries' needs. While this is a debatable point no such appropriate technology can be identified as regards communications, computers and information. Not to build the modern communication network is to simply inhibit ourselves from the flow of information from the outside causing a sort of information inequality.

Part Four

*World
of
Sports*

133. OLYMPICS

Olympics, the greatest of all sports events, is also the largest congregation of amateur competitors in every branch of sports and games. It has its origin in Greece. The earliest celebration of the Olympics is recorded to have taken place in July 776 BC, when Coroibos, a cook from Elis, won the foot-race. The ancient games were terminated by an order issued in Milan in AD 393 by Theodosius I, the Emperor of Rome.

Modern Olympic games are conducted every four years on venues selected by the International Olympic Committee. The games were revived in 1896 by a French Baron named Pierre de Coubertin.

Modern Olympics were staged at the following cities.

1896	April 6—April 15	Athens, Greece
1900	May 20—Oct. 28	Paris, France
1904	July 1—Nov. 23	St. Louis, USA
1908	April 27—Oct. 31	London, Britain
1912	May 5—July 22	Stockholm, Sweden
1916	Not held - world war	
1920	Apr 20—Sep. 12	Antwerp, Belgium
1924	May 4—July 27	Paris, France
1928	May 17—Aug. 12	Amsterdam, Holland
1932	July 30—Aug. 14	Los Angeles, USA
1936	Aug. 1—Aug. 16	Berlin, Germany
1940	Not held - world war	
1944	Not held - world war	
1948	July 20—Aug. 14	London, Britain
1952	July 19—Aug. 3	Helsinki, Finland
1956	Nov. 22—Dec. 8	Melbourne, Australia
1960	Aug. 25—Sept. 11	Rome, Italy
1964	Oct. 10—Oct. 24	Tokyo, Japan
1968	Oct. 12—Oct. 27	Mexico City, Mexico
1972	Aug. 26—Sept. 10	Munich, W. Germany
1976	July 17—Aug. 1	Montreal, Canada
1980	July 19—Aug. 3	Moscow, USSR
1984	July 28—Aug. 12	Los Angeles, USA

Seoul Olympics. Twenty-fourth games are scheduled to be held in Seoul, S. Korea in 1988.

This being called Summer Olympics, Winter Olympics also are held from 1924, again once in four years. 1984 Winter Games were held at Sarajevo, Yugoslavia.

Medals table in the 84 Games: East Germany 9 Gold 9 Silver, 6 Bronze, USSR 6 - 10 -

9, U.S. 4 - 4 - 0, Finland 4 - 3 - 6, Sweden 4 - 2 - 2, Norway 3 - 2 - 4, Switzerland 2 - 2 - 1, W. Germany 2 - 1 - 1, Canada 2 - 1 - 1, Italy 2 - 0 - 0, Britain 1 - 0 - 0, Czechoslovakia 0 - 2 - 4, France 0 - 1 - 2, Yugoslavia 0 - 1 - 0, Japan 0 - 1 - 0, Liechtenstein 0 - 0 - 2, Austria 0 - 0 - 1.

The greatest number of competitors in any Summer Games was 7,500 from 140 countries in spite of Soviet block boycott, in the 1984 Los Angeles Olympics, surpassing 7,174 from 122 countries in Munich in 1972. The fewest was 311 from 13 countries in the first Games at Athens in 1896. Only 12 countries took part in the Games in 1904. France entered the largest ever contingent of 880 men and four women in 1900 Paris Games.

XXIII Olympic (Summer) Games in Los Angeles, was the third Olympics in USA. Los Angeles played hosts for a second time, after 52 years.

The Soviet Union and its 13 allied countries kept out of Los Angeles Olympics, stating they were not satisfied with the security arrangements. Observers took it as a revenge of last Games when only 81 of the 142 members of IOC participated in the 1980 Moscow Olympics. It was U.S. who led the boycott then protesting against the military interference of USSR in Afghanistan. But still a good number of about 5,000 sportsmen and women from 140 nations took part. Now IOC is formulating a law to debar countries for ever, if they boycott a particular Olympics.

Million Dollar Games. Peter Ueberroth, 47, was the mastermind behind the four-million-dollar Los Angeles Games that involved four-fifths of the nations of the globe. He fashioned this greatest-show of sports without government aid and without fleecing the citizens. Even, Hollywood and

Disneyland took a fortnight's off to rejoice with a milling crowd of 92,000 watching the proceedings inside the stadium and another 30,000 standing outside the Los Angeles Memorial Coliseum during the opening ceremony. This was the Olympics witnessed by the whole world with more than 250 million watching it through television network. And the Games piled up \$ 150 million (Rs. 190 crore approx) surplus, ten times greater than predictions.

Hosts America dominated in almost every competition. And their 83 Golds surpassed the 80 won by Soviet Union in Moscow, four years ago. The Romanians and the Yugoslavs, the only Eastern Block countries to have taken part took away 71 medals — Romania with 20 Gold, 16 Silver 17 Bronze and Yugoslavia 7 - 4 - 7.

China, which took part for the first time made a fairly good impression with majority of success in weightlifting. And they had surprise victories in shooting too, with a total tally of 32 medals like the Italians.

India's Share. India does not have much to be proud of, but Kerala has. The Southern Star P. T. Usha raised the hopes of first ever Indian Athletic Medal by qualifying in 400 m Hurdles with a timing of 55.54 seconds beating U.S. Champion Judi Brown. But the first Indian Woman to reach an Olympic final, though ran her best in 54.42 seconds was late by one hundredth of a second finishing fourth.

Before her, another Kerala Star, Shiny K. Abraham, became the first Indian Woman to qualify for the semifinals in this Olympics. She competed in 800 meters. In 4 x 400 m relay Kerala girls Usha, Shiny and M. D. Valsamma along with Karnataka's Vandana Rao helped India reach the finals.

Indian Hockey Team had sad time. India, Gold Medalists in the previous Olympics in Moscow (1980), led by Zafar Iqbal could not even reach the last four stage. West Germany with better goal average entered semifinal. In the final, Pakistan defeated West Germany 2—1, in extra time. Bronze medal was won by Britain, who beat Australia. India beat Holland to win the fifth place.

Indian stars competed in Wrestling, Boxing, Shooting, Yachting and Weight Lifting also. But in all these events India performed very badly, and came nowhere near a medal.

The Star of this Olympics was Olympics was America's Carl Lewis. He won gold in the 100 metres, 200 metres, Long Jump and 4 x 100 metres relay. He became the second American to do so, equalling 1936 Berlin performance of compatriot Jesse Owens who won gold medals in the same four events. Carl Lewis literally outshone him, bettering time and distance.

This 23-year-old U.S. black started with 200 m clipping three-hundredths of a second to head a clean 1 - 2 - 3 American sweep in the event after 32 years. Then he made it a flash of lightning in the Long Jump pit, ran a whirl wind 100 m in the second fastest Olympic timing of 9.99 second. And in the company of the other three fastest men in the world he made it a grand finale registering the only world record in the track and field competition claiming the gold in 400 m relay in 37.83 sec.

Dalley Thompson, 26, from Britain, made it a second decathlon Gold equalling American Bob Mathias' double of 1948 and 52. Thompson scored 8797 points just one short of the world mark, but beating the world record holder Jurgen Hingsen of West Germany to second place. A new weighting of decathlon points is being adopted later with Thompson's score being upgraded to 8846 points earning him the world record without even lacing up his shoes.

Edwin Moses. Edwin Moses, who forgot his lines while taking oath made it as per script to defend 400 m Hurdles. With 105 straight wins he earned a place amongst greats like Jesse Owens, Paavo Nurmi and Emil Zatopek.

The other stars who shone the true Olympic spirit included Michael Gross, the West German Swimmer who got two world records along with Canadian Alex Baumann, Sebastian Coe of Britain who became the only athlete to retain 1,500 m.

The lady of the meet was the leggy Valarie Brisco Hooks of U.S. who won a 200 - 400 double, both with new marks and adding a share in the winning 1,600 m. relay team. Mother of a two-year-old, Valarie had a memorable game equalling the triple Gold of Wilma Rudolph of the 1960 Games.

Joan Bnoit, U.S., won the first ever Marathon of the Olympic history for women, the 26 miles race being thrown open to the fair sex after 56 years of athletics history.

American sprinter Evelyn Ashford, who was after a poor fifth performance of 1976, and being denied a chance in 1980 due to boycott ran a 10.97 sec. Olympic recorded 100 m to become the fastest woman of the meet.

Decker & Bud. In the midst of moments of ecstasy, there were glimpses of agony as well. An aghast stadium watched the race of the meet being marred as the favourite Mary Decker Seaney of U.S. was stripped in 3,000 meters as she was leading all the way at 1,600 m mark. Zola Budd the adapted South African on the British side was found to be interfered and she was disqualified, though it was no consolation for Mary for all the toil of all these years. After beating the 1972 silver medalist, she was denied the pleasure of running an Olympic race in 1976 and 1980 and this was her first chance.

Then there was the Jamaican quarter-miler Bertland Cameron after qualifying bravely in spite of pulling his hamstring was forced to withdraw in the finals. Added to it there were 12 athletes debarred for life, caught using performance boosting drugs.

In swimming America outshined all winning 21 Golds. In the new event of Synchronised Swimming also U.S. Women won Gold. They won a lot of Golds in boxing and wrestling and in Gymnastics won the men's team championship.

In the case of World Records Los Angeles was far behind, Moscow. In Moscow there were 36 World Records, but in Los Angeles it was only 11, ten in Swimming and the remaining one in Athletics.

Only a third of the 140 participating countries won medals at the 23rd Olympics. India was among the countries that drew blanks.

The 687 medals - 229 Gold, 229 Silver and 229 Bronze - were shared by 47 countries, the United States alone claiming 174.

Apart from China and Japan, which collected 32 medals each the rest of the Asian countries could manage just three medals among them— those won by Pakistan, Syria and Taiwan.

The Africans, with 12 medals, performed slightly better, while the South Americans won 25, Brazil leading the way with eight.

The Romanians and Yugoslavs, the only Eastern Bloc countries to have taken part in Olympics, took 71 medals—Romania 53 and Yugoslavia 18.

Medals Table

	G	S	B	T
United States	83	61	30	174
Romania	20	16	17	53
West Germany	17	19	23	59
China	15	8	9	32
Italy	14	6	9	32
Canada	10	18	16	44
Japan	10	8	14	32
New Zealand	8	1	2	11
Yugoslavia	7	4	7	18
South Korea	6	6	7	19
Britain	5	11	21	37
France	5	7	15	27
The Netherlands	5	2	6	13
Australia	4	8	12	24
Finland	4	2	6	12
Sweden	2	11	6	19
Mexico	2	3	1	6
Morocco	2	0	0	2
Brazil	1	5	2	8
Spain	1	2	2	5
Belgium	1	1	2	4
Austria	1	1	1	3
Portugal	1	0	2	3
Kenya	1	0	2	3
Pakistan	1	0	0	1
Switzerland	0	4	4	8
Denmark	0	3	3	6
Jamaica	0	1	2	3
Norway	1	2	3	6
Greece	0	1	1	2
Nigeria	0	1	1	2
Puerto Rico	0	1	1	2
Colombia	0	1	0	1
Egypt	0	1	0	1
Ivory Coast	0	1	0	1
Peru	0	1	0	1
Syria	0	1	0	1
Thailand	0	1	0	1
Ireland	0	1	0	1
Turkey	0	0	3	3
Venezuela	0	0	3	3
Algeria	0	0	2	2
Cameroon	0	0	1	1
Dominican Republic	0	0	1	1
Iceland	0	0	1	1
Chinese Taipei	0	0	1	1
Zambia	0	0	1	1

G- Gold, S- Silver, B- Bronze, T- Total.

Two golds and no silver awarded in each of following events: Women's 100m freestyle swimming, men's gymnastics individual pommel horse, rings, women's gymnastics uneven bars, balanced beam. Four silvers, no bronze in men's gymnastics vault. Two bronzes in men's gymnastics floor exercises. Two bronzes in pole vault. Two bronzes in all judo and boxing categories.

Olympics Results

1984 Los Angeles - Men

100 m: 1. Carl Lewis (US) 9.99; 2. Sam Graddy (US); 3. Ben Johnson (Can).

200 m: 1. Carl Lewis (US) 19.80 (Oly. Rec.); 2. Kirk Baptiste (US); 3. Thomas Jefferson (US).

400 m: 1. Alonzo Babers (US) 44.27; 2. Gabriel Tiacoh (CLV); 3. Antonio McKay (US).

800 m: 1. Joaquim Cruz (Bra) 1:43.00 (OR); 2. Sebastian Coe (GBR); 3. Earl Jones (US).

1500 m: 1. Sebastian Coe (GBR) 3:32.53 (OR); 2. Stev Cram (GBR); 3. Jose Abascal (Spain).

3000 m steeplechase: 1. Julius Korir (Ken) 8:11.80; 2. Joseph Mahmud (Fra); 3. Brian Diemer (US).

5000 m: 1. Saïed Aouita (Morocco) 13:05.59 (OR); 2. Markus Ryffel (Swe); 3. Antonio Leitao (Por).

10,000 m: 1. Alberto Cova (Ita) 27:47.54; 2. Martti Vainio (Fin); 3. Michael McLeod (BBR).

Marathon: 1. Carlos Lopes (Por) 2:09.21; 2. John Treacy (Irl); 3. Charles Spedding (GBR).

110 m H: 1. Roger Kingdom (US) 13.20 (OR); 2. Gregory Foster (US); 3. Arto Byggare (Fin).

400 m H: 1. Edwin Moses (US) 47.75; 2. Danny Harris (US); 3. Herald Schmid (FRG).

20 km walk: 1. Ernesto Canto (Mex) 1:23.13; 2. Raul Gonzales (Mex); 3. Maurizio Damilano (Ita).

30 km walk: 1. Raul Gonzales (Mex) 3:47.26; 2. Bo Gustafsson (Swe); 3. Sandro Bellucci (Ita).

400 m. relay: US (Sam Graddy, Ron Brown, Calvin Smith and Carl Lewis) 37.83 (OR) and WR; 2. Jamaica; 3. Canada.

1600 m relay: US (Sunder Nix, Ray Armstead, Alonzo Babers and Antonio McKay) 2:57.91; 2. Great Britain; 3. Nigeria.

High Jump: 1. Dietmar Moegenburg (FRG)

2.35; 2. Patrci Sjoeborg (Swe) 3. Zhu Jianhua (Chn).

Pole vault: 1. Pierre Quinon (Fra) 5.751; 2. Mike Tully (US); 3. Earl Bell (US).

Long Jump: 1. Carl Lewis (US); 2. Gary Honey (Aust); 3. Giovanni Evangelistic (Ita).

Triple Jump: 1. Al Joyner (US) 17.26; 2. Mike Conley (US); 3. Keith Connor (GBR).

Shot Put: 1. Alessandro Andrei (Ita) 21.26; 2. Michael Carter (USA); 3. Dave Laut (US).

Discus: 1. Rolf Danneberg (FRG) 66.60; 2. Mac Wilkins (US); 3. John Powell (US).

Hammer throw: 1. Juha Tiainen (Fin) 78.08; 2. Karl Hans Riehm (FRG); 3. Klaus Ploghaus (FRG).

Javelin: 1. Arto Haerkoenen (Fin) 86.76; 2. David Otley (GBR); 3. Kenth Elderbrink (Swe).

Decathlon: 1. Daley Thomson (GBR) 8,797 (OR); 2. Jurgen Hingsen (FRG); 3. Siegfried Wentz (FRG).

Women

100 m 1. Evelyn Ashford (US) 10.97 (Oly. Rec.). 2. Alice Brown (US), 3. Merlene Ottery - Page (Jam).

200 m: 1. Valerie Brisco-Hooks (US) 21.81 (OR), 2. Florence Griffith (US), 3. Merlene Ottery - Page (Jam).

400 m: 1. Valerie Brisco Hooks (US) 48.83 (OR) 2. Candra Cheesborough (US) 3. Kathryn Cook (GBR)

800 m: 1. Doina Melinte (Rom) 1:57.60; 2. Kim Gallager (US); 3. Fita Lovin (Rom).

1500 m: 1. Gabrielle Dorio (Ita) 4:03.25; 2. Doina Melinte (Rom); 3. Maricica Puica (Rom).

3000 m: 1. Maricica Puica (Rom) 8:35.96 (OR); 2. Wendy Sly (GBR); 3. Lyn Williams (Can).

Marathon: 1. Joan Benoit (USA) 2:24:52; 2. Grete Waltz (Nor); 3. Rosa Mota (Por).

100 m hurdles: 1. Benita Fitzerlad Brown (US) 12.84; 2. Shirley Strong (GBR); 3. Kim Turner (US).

400 m H: 1. Nawal El Moutawakel (Morocco) 54.61 (OR); 2. Judi Brown (USA); 3. Cristina Cojocar (Rom).

400 m relay: 1. US (Alice Brown, Janet Bolden, Candra Cheesborough, Evelyn Ashford) 41.65; 2. Canada; 3. Britain

1600 m relay: 1. US (Lillie Leatherwood, Sherri Howard, Vakerue Brisco Hooks and Candra Cheesborough) 3:18.29 (OR); 2. Canada; 3. West Germany (FRG).

High Jump: 1. Ulrike Meyfarth (FRG) 2.02 (OR); 2. Sara Simeoni (Ita); 3. Joni Huntley (US).

Long Jump: 1. Anisoara Stanciu (Rom) 6.96; 2. Vali Ionescu (Rom); 3. Susan Hearnshaw (GBR).

Shot Put: 1. Claudia Losch (FRG) 20.48; 2. Mihaela Loghin (Rom); 2. Gael Martin (Aust)

Discus: 1. Ria Stalman (Hol) 65.36; 2. Leslie Deniz (US); 3. Florenta Craculnescu (Rom).

Javelin: 1. Tessa Sanderson (GBR) 69.56 (OR); 2. Tina Lillak (Fin); 3. Fatima White Bread (GBR).

Heptathlon: 1. Glynis Nunn (Aust) 6,390 points; 2. Jackie Joyner (US) 6,385; 3. Sabine Everts (FRG) 6,363.

134. ASIAN GAMES

The origin of Asian Games goes back to 1947 when the Asian Relations Conference held at New Delhi, decided to organise an international games meet for Asian countries on the lines of Olympic games, once in four years. Since then the games have grown into an organisation with 33 participating countries.

The Games were held at New Delhi, India (1951); Manila, Philippines (1954); Tokyo, Japan (1958); Jakarta, Indonesia (1962); Bangkok, Thailand (1966); Bangkok, Thailand (1978); Teheran, Iran (1974); Bangkok, Thailand (1978); and New Delhi, India (1982).

1986 Games are scheduled to be at Seoul in S. Korea.

Delhi Asiad. Ninth Asian Games in 1982 was the biggest sporting event in India. New Delhi hosted the Games from Nov. 19th to Dec. 4th. A couple of items were conducted at Bombay and Jaipur.

China emerged champions in seven out of the 21 disciplines (Badminton, Gymnastics, Handball, Rowing, Shooting, T.T., and Weight-lifting) and shared glory with Japan and South Korea in Basketball and Volleyball.

Japan was placed; second, it reigned supreme in Athletics, Cycling, Swimming and Wrestling.

South Korea became champions in archery, boxing and tennis. India took first position in equestrian, golf and women's hockey and Pakistan in men's hockey and yatching.

Football was dominated by West Asian countries.

China ended up with the impressive gold tally of 61—four more than Japan. South Korea with 28 gold stood third, while India was placed fifth with 13 gold. India's tally of 13 golds was her highest since the inaugural

Games in 1951.

India's Highest. The overall tally of 57 represented India's highest haul in Asiad, the previous best being 52 in the inaugural Games in 1951.

In all, 33 countries participated in the 15-day games. The largest contingent was from India (644) followed by Japan (462). Lebanon sent only a 10-member squad.

The following countries participated. Afghanistan 20. Bangladesh 103 (77 men, 5 women, 21 officials). Bahrain 118 (72-3-43). Burma 70 (49-4-17). China (453 (224-88-141). South Korea 404 (266-79-59). Hong Kong 220 (124-60-36). Indonesia 201 (126-42-33). Iran 170 (149-0-21). Iraq 93 (80-0-10). Japan 462 (277-108-77). North Korea 340 (193-95-52). Kuwait 223 (160-0-63). Laos 16 (5-4-7). Mongolia 41 (25-1-5). Nepal 127 (91-10-26). Pakistan 138 (112-0-26). Philippines 245 (144-52-49). Qatar (79 (58-0-21). Saudi Arabia 260 (209-0-51). Singapore 70 (36-19-15). Sri Lanka 92 (61-13-18). Syria 72 (53-0-19). Thailand 256 (151-62-43). UAE 114 (87-0-27). Vietnam 29 (14-5-10). Yemen 102 (76-3-23). Yeman PDR 86 (62-4-20). India 644 (340-121-183).

The games opened on November 19, 1982 amidst solemn pageantry at the newly built Jawaharlal Nehru Stadium.

A near-capacity crowd of over 75,000 heard the President Zail Singh declaring open the Games, the biggest so far involving 33 nations and more tha 4500 participants.

The torch lit by Prime Minister Indira Gandhi at the National Stadium earlier was relayed by runners, before it was brought into the stadium by the veteran athlete Gurbachan Singh and taken around by the flying Sikh Milkha Singh, and Kamaljit Sandhu. Balbir Singh, the former Indian hockey captain and Diana Simes finally lit the ceremonial flame which burned until the games closed on December 4.

Medal Table

	G	S	B
China	61	51	41
Japan	57	52	44
S. Korea	28	28	37
North Korea	17	19	20
India	13	19	25
Indonesia	4	4	7
Iran	4	4	4
Pakistan	3	3	5
Mangolia	3	3	5
Philippines	2	3	9
Iraq	2	3	4
Thailand	1	5	4
Kuwait	1	3	3
Malaysia	1	0	3
Singapore	1	0	2
Syria	1	0	0
Lebanon	0	1	0
Afghanistan	0	1	0
Hongkong	0	1	1
Vietnam	0	0	1
Bahrain	0	0	1
Qatar	0	0	1
Saudi Arabia	0	0	1

Placings

Football: 1. Iraq, 2. Kuwait, 3. Saudi Arabia.
Hockey: 1. Pakistan, 2. India, 3. Malaysia.
Women's Hockey: 1. India, 2. Malaysia, 3. Korea.
Basketball: 1. Korea, 2. China, 3. Japan.
Women: 1. China, 2. Korea, 3. Japan.
Volleyball Men: 1. Japan, 2. China, 3. Korea.
Women: 1. China, 2. Japan, 3. Korea.
Badminton: 1. China, 2. Indonesia, 3. India and South Korea.
Women: 1. China, 2. Japan, 3. South Korea and India.
Badminton Men Individual: 1. Hanjian (China), 2. Lim Swie King (Indonesia), 3. Syed Mody (India) and Cheng Chang Shi (China).
Women: 1. Sang Ailing (China), 2. Lie Lingwe (China), 3. Sumico Kittada and

Kim Yun Jack (Korea).
Tennis Men: 1. Indonesia, 2. India, 3. China.
Individual Champion: Tarik (Indonesia).
Women: 1. Korea, 2. China, 3. Japan.
Individual: Est Suko Inovu (Japan).
T.T. Men: 1. China, 2. Japan, 3. Korea.
Women: 1. China, 2. Korea, 3. DPR Korea.
Individual: Sinalke (China-Men), Kavo Yan Hua (China-Women).
Handball: 1. China, 2. Japan, 3. South Korea.

Winners for India

Gold: Charles Boromeo (800 m), Chandram (20 km walk), Bahadur Singh (Shot put), M.D. Valsamma (400 m H).

Silver: K.K. Premachandran (400 m) Gopal Saini (3000 m steeple chase) Kuldip Singh (Discus), P.T. Usha (100 m and 200 m), Gita Zutshi (800 m and 1500 m), Mercy Mathew (Long jump and 400 m relay).

Bronze: Sureh Yadav (1500 m) Parveen Jolly (110 m Hurdles), Raj Kumar (5000 m), Sitaram (Marathon), Balwinder Singh (Shot Put), Gurtej Singh (Javelin), Balasubramaniam (Triple Jump), Padmini Thomas (400).

Results: 1982 Delhi - Men

100 m: 1. Ruban Pit (Malaysia) 10.72; 2. Jae Keun Jang (S. Korea); 3. Suchart Jaesuraparp (Thailand).

200 m: 1. Jae Keun Jang (S. Korea) 20.89 secs. (record, old 21.09 secs); 2. Toshio Toyoda (Japan); 3. Rabuan Pit (Malaysia)

400 m: 1. Susummu Takano (Japan) 46.65; 2. K.K. Premachandran (India); 3. Guo Shunqui (China).

800 m: 1. Charles Borromeo (India) 1:46.8 (record old 1 min. 47.6 secs); Hasan D. Mohammad (Iraq); Bogja Kim (Korea).

1500 m: 1. Faleh M. Jarala (Iraq) 3:43.49 (old 3:47.30); 2. Yataka Hirai (Japan) 3. Suresh Jadav (India)

5000 m: 1. Masanri Shintaki (Japan) 13:53.74 (old 14:20.6); 2. Zhang Gouwei (China); 3. Rajkumar (India).

10000 m: 1. Zhang Guowei (China) 29:37.56 (old 29:55.6); 2. Kenji Ide (Japan); 3. Woh Keun Park (S. Korea).

110 m H: 1. Yoshifumi Fujimori (Japan) 14.08 (old 14.26); 2. Zhang Shensheng (China); Praveen Jolly (India).

400 m. H: Takshi Nagao (Japan) 50.60; 2. Shigendri Omori (Japan); 3. Ahmed Jassim Hamada (Bahrain)

4×100: 1. China 39.82 (old 40.41); 2. Thailand; 3. Japan.

4×400: 1. Japan 3:06.75 (old-3.07.04); 2. Iraq; 3. China.
 3000 m. Steeplechase: 1. Tadasu Kauano Japan (8.43.3); 2. Gopal Saini (India) 3. Hector Begeo (Philippines).
 High Jump: 1. Zhu Jianhua (China) 2.33 (old 2.20); 2. Chu Chi (China); 3. Takao Sakamoto (Japan).
 Long Jump: 1. Chong Il Kim (S. Korea) 7.94; 2. Li Yuhuang (China); 3. Junichi Usui (Japan).
 Pole Vault: 1. Tomomi Takahashi (Japan) 5.30 (old 5.10 m); 2. Kamily Treuhisa (Japan); 3. Cheng Zhang (China).
 Triple Jump: 1. Zhou Zhenxiang (China) 16.80 (old 16.56 m); 2. Yasushi Ueta (Japan); 3. Balasubramaniam (India).
 Discus: 1. Lei Wienan (China) 58.50 (old 56.82); 2. Kuldip Singh (India); 3. Li Zheng (China).
 Hammer: 1. Shigenobu Murofushi (Japan) 71.14 (old 68.25 m); 2. Masayuki Kawaita (Japan); 3. Xie Yingqui (China).
 Javelin: Toshihiko Takeda (Japan) 75.04, 2. Yeugn Yung Yang (S. Korea); 3. Gurtej Singh (India).
 Shot Put: Bahadur Singh (India) 18.53 (old 18.04); 2. Mohammed Abel (Kuwait); 3. Balvinder Singh (India).
 20 km Walk: 1. Chand Ram (India) 1:29.54.4 (old 1:31:54.4); 2. Wang Chuntang (China); 3. Zhang Fuxin (China).
 50 km Walk: 1. Wang Chuntang (China) 4:9.36.00 (old 5:44:74); 2. Qui Shiyog (China); 3. Fujisaki Akira (Japan).
 Marathon: 1. Yang Kon Kim (S. Korea) 2:2:21.00. 2. Fumiaki Abe (Japan). 3. S. Seetarama Kukkapa (India).
 Decathlon: 1. Weng Kanquiang (China) 7431 (old 7375 pts); 2. Zhai Yingjin (China); 3. Mansar Saleh (Qatar).

Women

100 m: 1. Lydia de Vega (Philippines) 11.76 secs; 2. P.T. Usha (India) 11.95; 3. Myung

Hee Mo (S. Korea) 11.99.
 200 m: 1. Hiromi Isozaki (Japan) 24.22; 2. P.T. Usha (India) 24.32; 3. Myung Hee Mo (S. Korea).
 400 m: 1. Hiromi Isozaki (Japan) 54.43 (record old 55.08); 2. Junko Yosida (Japan) 3. Padmini Thomas (India) 55.14.
 800 m: 1. Yong Ae Chang (N. Korea) 2 min 05.61; (record old 2:05.71); 2. Gita Zutshi (India); 3. Gup Cuimei (China).
 1500 m: 1. Yong Ae Chang (N. Korea) 4 min 18.40 (record old 1.18.9); 2. Gita Zutshi (India); 3. Ok Son Kim (N. Korea).
 3000 m: 1. Ok Son Kim (N. Korea) 9.30.32; 2. Chun Hwa Kim (N. Korea); 3. Shini Izutsu (Japan).
 100 m. H: 1. Emia Kimoto (Japan) 13.63; 2. Chizuko Akimoti (Japan); 3. Dai Jianhua (China).
 400 m H: 1. M.D. Valsamma (India) 58.46 (record old 1 min. 32 secs); 2. Yumiko Ao Japan; 3. Llu Guhua (China).
 4×100 m: 1. Japan 45.13 (record; old 46.20); 2. Thailand; 3. South Korea; India 6th
 4×400 m: 1. Japan 3:37.44 (Games record; old 3.43.5); 2. India (Rita Sen, Hamida Banu Valsamma, Padmini Thomas); 3. China
 High Jump: 1. Zhen Dehang (China) 1.89 m (Games record; old 1.88 m); 2. Hisayo Fukumitsa (Japan); Yang Wengun (China).
 Long Jump: 1. Liao Wenfen (China) 6.4 (record; old 6.31 m); 2. Mercey Mathew (India); 3. Li Huirong (China).
 Discus: 1. Li Xiao Hui (China) 57.24 (Game record; old 55.92 m); 2. Xin Xiaoya (China); 3. Harumi Suzuki (Japan).
 Javelin: 1. Emi Matsui (Japan) 60.52; (record old 57.22 m); 2. Li Shufen (China); 3. Mori Minori (Japan).
 Shot Put: 1. Li Meisu (China) 17.77 (old 17.7 m); 2. Shen Lijuan (China); 3. Tetsuki Watase (Japan).
 Heptathlon: 1. Ye Peisu (China) 5 594 pts. 2. Ye Lianying (China); 3. Tomoko Uchida (Japan).

135. COMMONWEALTH GAMES

Commonwealth Games are conducted every four years on the lines of the Olympics, but entries are limited to Commonwealth countries only. Games have been staged in the following cities.

1930 Hamilton (Bermuda), 34 London (Britain), 38 Sydney (Australia), 50 Auckland (New Zealand), 54 Vancouver (Canada), 59 Cardiff (Britain), 62 Perth (Australia), 67 Kingston (Jamaica), 70 Edinburgh (Britain), 74

Christ Church (New Zealand), 78 Edmonton (Canada), 82 Brisbane (Australia).

Medal position in the Twelfth Games held in October 1982 at Brisbane.

Country	Gold	Silver	Bronze
Australia	39	39	29
Britain	50	48	45
Canada	26	23	33
New Zealand	5	8	13
India	5	8	3
Nigeria	5	0	8
Kenya	4	2	4

Bahamas	2	2	2
Jamaica	2	1	1
Tanzania	1	2	2
Malaysia	1	0	1
Fiji	1	0	0
Hongkong	1	0	0
Zimbabwe	1	0	0
Ireland	0	3	3
Uganda	0	3	0
Zambia	0	1	5
Guyana	0	1	1
Bermuda	0	0	1
Singapore	0	0	1
Swaziland	0	0	1

136. SAF GAMES

The first South Asian Federation Games at Dasarath Stadium, Kathmandu, Nepal was staged in Sept. 84. Overall champion was India with 88 medals (44-28-16). Sri Lanka with 30 medals (7-11-12) were runners. In Athletics India had 24 (10-8-6) and Sri Lanka 14 (5-5-4). India's 24 -member swimming team brought 45 medals with 20 - year-old CRPF Inspector Khajan Singh accounting for eight medals himself. Bengal's 16 -year-old Bula Chowdhury claimed gold in all four events - 100 & 200 butterfly, 100 m freestyle and 400 B.S. realy.

Sri Lanka's 6 swimmers grabbed 15 medals with 18 -year-old Julian Boiling winning five herself. Four Bangladesh swimmers won nine medals.

In the second Games 1985 Dec. Dhaka, Bangladesh, two more disciplines were added to make the total seven. The whole ceremony was on a lower key and Indian contingent though a depleted side topped honours this time also. The Indians per-

formed well in Athletics, Swimming and Weight lifting and won the Footaball totalling 89 medals.

Ace Indian runner Shiny Abraham who won gold in 200m and 800m was adjudged as the 'Woman of the Meet' by Bangladesh Sports Writers Association. Bangladesh swimmer Mosharaff Husain Khan had the title in men's section. The others adjudged best were: Athletics (men) - Shah Alam (Bangladesh), Kabaddi - Sukhbinder Singh (India), Wrestling-Abdul Mazid (Pakistan). Boxing-S. Jairam (India). Weightlifting-G. Mathivanan (India). Football Best Player-Kaiser Hamid (Bangladesh); Top scorer—Sisir Ghosh (India- 4 goals).

Medals Tally: India 46 Gold, 29 Silver, 14 Bronze, Pakistan 16-19-9, Bangladesh 9-16-34 Sri Lanka 2-4-7, Nepal 1-5-12, Bhutan 0-0-4

Next SAF Games will be hosted 64 India in 1987, skipping 1986 being the year of Commonwealth and Asian Games

137. NATIONAL GAMES

National Games were revived after seven years and were conducted in New Delhi in Nov 1985. About 2600 athletes participated in the one-week event of 26 disciplines. Four states were allowed to compete in team games. Championship decided on 10-7-5 points system. Jasmene Arethna, 17 -year-old cycling phenomenon from Maharashtra and

Reza Shirazi, 16 -year-old swimmer also from Maharashtra were adjudged the bests. G. Muthuswamy Jr. weightlifter from Tamil Nadu came closer to Reza by rewriting 100m Commonwealth records

Maharashtra won National Gold Trophy. Punjab the Silver and Karnataka the Bronze though Delhi and M.P. finished up in

medals table. Medals tally:

State	Gold	Silver	Bronze
Maharashtra	51	35	32
Punjab	32	20	27
Delhi	22	15	19
Madhya Pradesh	21	9	11
West Bengal	20	29	32
Haryana	15	15	13
Uttar Pradesh	14	12	13
Kerala	12	11	7
Karnataka	10	23	24
Tamil Nadu	6	10	12
Manipur	6	6	4
Rajasthan	4	11	14
Andhra Pradesh	4	8	7
Chandigarh	4	1	3
Orissa	3	3	3
Himachal Pradesh	3	0	2
Bihar	1	12	12
Gujarat	1	1	3
Assam	0	1	4
Jammu and Kashmir	0	1	0
Meghalaya	0	0	2

Athletics: Vijay Pal Singh 18-year-old Agri student from Haryana posted new national mark clearing 4.91 m. in Pole Vault. Sarnam Singh U.P. threw Javelin to a record distance of 78.38 m. P. T. Usha won gold in 100 m. Hurdles and 400 m. Shiny Abraham, Kerala, won gold in 800 m, 200 m Silver in 400 m. M. D. Valsamma equalled career best of 13.9 secs in 100 m Hurdles. Ram Reddy of A.P. bt. nine-time National Champ Adil Suman Wales of Mah. to become the fastest athlete and won the 200 m. also to earn the sprint double.

Football: 1. Punjab, 2. Mah., 3. Andhra.

Hockey: Men: 1. U.P., 2. Maharashtra, 3. Punjab. Women: 1. Punjab, 2. Bihar, 3. Karnataka.

Volleyball: Men: Kerala bt. Haryana 15-12, 10-15, 15-8, 8-15, 15-2. Women: Kerala bt. T. N. 15-2, 15-11, 15-13.

Basketball: Men: 1. Delhi, 2. Rajasthan, 3. T.N. Women: 1. Punjab, 2. Maharashtra, 3. Kerala.

Tennis: Men: 1. Maharashtra, 2. Bengal, 3. A. P. Women: 1. Maharashtra, 2. Delhi, No

bronze awarded as there were only three teams.

Table Tennis: Men: Kamlesh Mehta Mah. bt. S. Sriram Mah. 3-0. Women: Vyoma Parikh Mah. bt. Monalisa Barua Assam 3-1. Team-Men: 1. Delhi, 2. Mah, 3. Assam. Women: 1. Maharashtra, 2. Karnataka, 3. T.N.

Badminton: Singles Men: Syed Modi U.P. bt. Harjeet Singh Delhi 2-0. Women: Madhumita Bist Bengal bt. Seema Bhandari M.P. 2-0. Doubles: Men: Sanal Misra Orissa and Levoy D'sa Mah. Women: Anu Ghia Mah. and Madhumita Bist Bengal.

Handball: Men: 1. Punjab, 2. J & K, 3. Maharashtra. Women: 1. Mah, 2. Punjab, 3. Bengal.

Swimming: Reza Shirazi Anita Sood, both of Mah won six golds each. Maharashtra picked 21 of 29 golds.

Rowing: 1. Maharashtra, 2. Bengal, 3. U.P.

Equestrian: Capt. J.S. Ahluwalia Punjab.

Archery: 1. Bengal, 2. U.P., 3. Manipur.

Shooting: Punjab won 8 of the 12 medals. Skeet gold was claimed by Harinder Singh Bedi of Punjab who beat Veteran Olympian Karni Singh who was once of world standard. M.P. men and Bengal women won the honours.

Cycling: Brothers Sikandar Singh & Balkar Singh shared seven golds and added another for their team Punjab. Jasmine Arathena won all four golds in women's section. Trevor Maxwell, national record holder for Andhra in 1000 m time trial was banned as he returned the certificate for second place.

Boxing: 1. Maharashtra, 2. Karnataka, 3. Delhi.

Weight lifting: Five Commonwealth all by G. Muthuswamy of T.N. and 7 National records broken, Jagmohan Sapru of Delhi rewriting two national marks. Delhi and T.N. won 8 golds 2 Silver and 3 Bronze each. In the women championship introduced for the first time Karnataka won 10 golds 5 Silver and one Bronze.

Judo: Open category- 1. Sandeep Bazala Punjab, 2. C. Billumona, Mah 3. K. K. Gupta Bengal and Paramjit Arya Delhi.

Kabaddi: Men: 1. Mah, 2. Karnataka, 3. M.P. Women: 1. Mah, 2. Bengal, 3. M.P.

Talkwondo: U.P. and Haryana won.

138. NATIONAL WOMEN'S SPORTS

In the 10th National Women's Sports & Games held at Coimbatore in 1985 Dec. 2500 Women athletes participated in 14 disciplines. T. N. with 31 points bagged overall championship followed by Bengal (18.5 points) and Karnataka (18 points). Andaman Nicobar adjudged most impressive in march-past.

Athletics: 1. T.N. 93, 2. U.P. 45, 3. Kerala 32. Suman Rawat of Himachal excelled with three golds in 800 m., 1500 m and 3000 m. K.N. Saliamma of T.N. won 100 m and 200 m to bag sprint double.

Hockey: Karnataka bt. Kerala 5-1. 3rd place: U.P. bt. Bihar 8-1.

Volleyball: 1. T.N., 2. Bengal, 3. Punjab.

Badminton: 1. Punjab, 2. T.N., 3. Andhra.

Swimming: 1. Karnataka 79 points, 2. T.N. 74, 3. Kerala and Bengal 69.

Tennis: Singles - Sukanya Chawdhury Assam. Doubles: Sukanya and Jeena Bardolai

Assam.

Table Tennis: 1. Kerala, 2. Bengal, 3. T.N.

Kho Kho: Mah. bt. holders M.P. 11-5
Placings: 1-Mah, 2. Kar. 3. M.P..

Kabbadi: 1. Bengal, 2. T.N., 3. Mah.

Handball: Karnataka. 2. Maharashtra, 3. Kerala.

Golf: 1. Delhi (Ranu Ahluwalia, Jyotika Shamsheer Singh and Sita Rawley) 2. T.N. (Aruna Kulandaivelu, Susi Kurien and Saroja Raman). No bronze was awarded.

Medals tally: T.N. 13 Gold, 11 Silver, 7 Bronze. Karnataka 10-4-4, Bengal 8-9-3, Haryana 4-3-3, U.P. 3-1-5, H.P. 3-1-1, Delhi 3-0-2, Punjab 1-5-3, Kerala 1-4-3, Mah 1-3-4, Gujarat 1-0-2, Bihar 0-3-1, Chandigarh 0-1-3, Assam 0-1-2, Andhra 0-1-1, M.P. 0-0-2, Tripura 0-0-1. Tally includes swimming and golf held at Madras. Two golds and two bronze awarded in Gymnastics. In Golf no bronze was awarded.

139. NATIONAL SCHOOL GAMES

Delhi: January 1985. Punjab Sr. Boys won overall championship 2. Delhi Sr. Girls Kerala Jr. Girls UP boys and Mah. girls won. Hockey: Punjab. boys bt. Delhi 1-0, Punjab

girls bt. Mah 3-0, Volley: Haryana boys bt. A.P. 3-0, Kerala girls bt. Delhi 3-2, Badminton: A.P. boys bt. Delhi 3-0, Punjab girls bt. Delhi 2-0.

140. ATHLETICS

First **World Athletics** August 1983 at Helsinki. East Germany won title. First ever 1-2-3 sweep by U.S. in 100 m since 1913 Olympics, Carl Lewis winning in 10.07 seconds.

Edwin Moses U.S. won 400 m hurdles, his 81st consecutive win.

World record high jumper Zhu Jianhua of China got only a bronze. Steve Ovett (Britain) finished only 4th in 1500 meters. Albert Juantorena, the Cuban double gold medalist of last Olympics fractured a bone in 800 m

heats and was out.

East Germany completed a medal sweep in Heptathlon for women. 32-year-old Jarmila Kratochvilova of Czechoslovakia won 400 m in world record time of 47.99 and also 800 m. 29-year old Norwegian Grete Waitz won Marathon.

International Amateur Athletic Federation met the entire cost of two athletes, one male and one female from each country. Indian long jumper Mercy Mathew Kuttan could not produce a single valid jump while Chand Ram finished 42nd in 20 km walk.

Usha: Jewel In the Crown

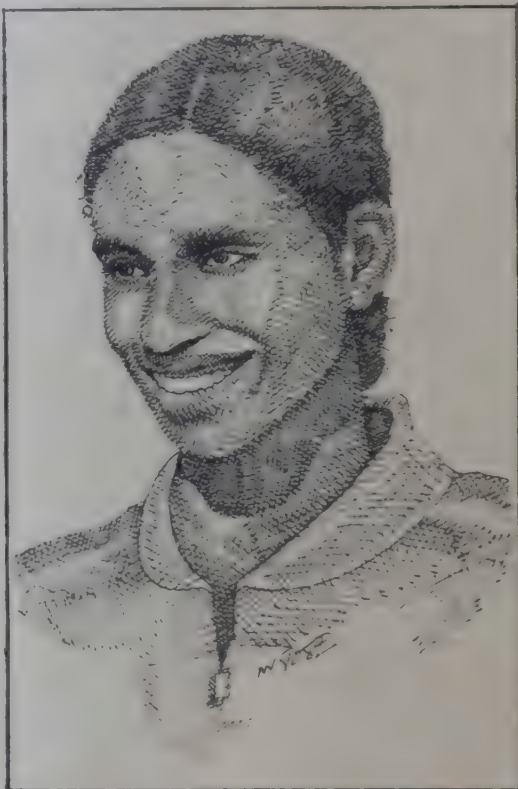
P.T. Usha, the jewel in the crown of Indian Athletics is surging forward. Ever since she came on to the scene, there has never been any stopping. And, 1985 can well be considered as her most productive year, so far.

After her touch-and-go affair with the Olympic medal at Los Angeles, there is a marked improvement in Usha's performance. Motivation and perseverance along with her ever maturing natural talent, have taken her into new heights of achievement.

The Sixth Asian Track and field championship at Jakarta saw P.T. Usha at her international best, medalwise. She won five golds there in her favourite sprints—100 and 200 meters, 400 metre and 400 meter hurdles and she was the anchor for Indian women's 4×400 meter relay gold.

At Jakarta, she became the Star of Asian Athletics. No athlete in India has ever come anywhere near Usha's achievements in an international event. Even in Asia, Usha has few, if any, parallels.

She captained the Asian team in the World Cup at Canberra. But she could not continue her winning streak there. Before Jakarta, Usha had already become the best Railway Athlete in the world at Olomouc, Czechoslovakia. October, 1985 saw her being adorned with the Arjuna Award.



During the November nationals at New Delhi, Usha once again proved that she is the best. Her only worry, now must be lack of good competition here. This super sprinter from Payyoli, Kerala is now all set and on her marks for the Second Asian and later, the Olympics.

World Cup Athletics at Canberra, Australia in Oct. 85: world record holders in 12 out of 32 individual events competed but only two world records were broken, both by GDR women, Martina Koch in 400 m and in the team quarter in 4 × 100. U.S. men team won championship beating USSR and GDR women won vs. Soviets. Asian team under P. T. Usha with 7 Indians were sixth in women section and seventh and last in men's section.

Women: 1. East Germany (GDR) 121, 2. USSR 105, 3. Europe 86, 4. USA 61, 5. Oceanic 52, 6. Asia 42, 7. Africa 41, Men: 1. U.S. 123, 2. USSR 115, 3. GDR 114, 4. Europe 97, 5. Africa

81, 6. Oceanic 65. Best by Indian representatives were 7th place in 400 m hurdles (56.36 sec) by P. T. Usha and 7th by Balwinder Singh in shot put. Shiny Abraham (800 m), Vandana Rao (200 m), Bageicha Singh (1500 m) and Raghubir Singh (Hammer) placed eighth in their events.

Asian Track & Field Athletics at Jakarta Sept. 1985: Six Asian records broken. China won 19 golds, 15 silver and 8 bronze. 42-member Indian squad won 21 medals including 10 golds, five by P. T. Usha herself. P. T. Usha won golds in 100, 200, 400, 400 m H and 4 × 400 and a bronze in

4 × 100. Shiny Abraham won gold in 800 and 4 × 400. Balwinder Singh won shot put,

Raghubir Singh Bel in Hammer, Bageicha Singh in 1500 m.

141. BADMINTON

World Cup Badminton at Jakarta in Sept. Singles men: Iuck Sugianto, Indonesia bt. Morten Frost Denmark 15-11, 8-15, 15-4. Women: Li Lingwei China retained vs. Ivana Lie Indonesia 11-3, 11-2. Doubles: Men: Liem Swie King and Hariatmanto Kartono Indonesia bt Li Yongho and Tian Bingy China 15-11, 11-15, 15-11. Women: Lin Ying and Wu Dixi bt. Yun Ja Kim and Sang Hee Yoo S. Korea 15-4, 15-5. Mix doubles: Iva and Christian Hadinate Indonesia bt. Sten Fladberg Denmark and Nova Perry Britain 15-11, 18-17.

World Badminton at Calgary, Alberta June 85. Singles Men: Han Jian China bt. Morten Frost Denmark 14-19, 15-10, 15-9. Women: Han Aiping China bt. Wu Jianqui China 6-11, 12-11, 11-2. Doubles women: Han Aiping and Li Lingwei China bt. Lin Ying and Wu Dixi China, defending champions 15-9, 14-18, 15-9. Men: Joo Bong Park and Mon Soo Kim China bt. Li Yongho and Tian Bengei China 5-15, 15-7, 15-9. Mixed doubles: Joo Bong Park and Sang Hee Yoo China bt. Stefan Karison and Maria Bengston Sweden 15-9, 12-15, 15-12.

International Masters Badminton: Kirsten Larsen of Denmark retained women's singles in Bournemouth October 1985, beating Gillian Gowers of England, 11-5, 11-0. Morten Frost retained men's singles vs. Steve Butler 15-12, 11-15, 15-11.

International Badminton Moscow Oct. 85: India's Syed Modi outclassed Andrei Antropov of Soviet Union 15-5, 15-5 to win men's singles. Soviet womens singles: Tatiana Litvinenko bt. Svetlana Belyasova 11-3, 12-9. Men's doubles: Tomas Kunstler and Shtefan (East Germany) beat Akselson and Herrgardh (Soviet Union) 15-6, 11-15, 15-8. Women's doubles: Belyasova and Elena Rybina beat Litvinenko and Viktoria Pron 15-8, 2-15, 15-5.

Indira Gandhi Grand Prix at Delhi Sept 85: Steve Baddeley of Britain won men's singles

defeating South Korean Joo Bong Park 18-17, 15-12. Helen Troke, also of Britain, won women's singles vs. Kirsten Larsen of Denmark 11-8, 11-8. Doubles men: Joo Bong Park and Moon Soo Kim S. Korea bt. Steve Baddley and Nick Yates U.K. 15-3, 15-5. Women: Haeng Suk Kang and Sun Ae Hwang S. Korea bt. Gillian Clark and Gillian Gowers U.K. 15-7, 15-12. Mixed: Steve Baddley and Gillian Gowers U.K. bt. Moon Soo Kim and Haeng Suk Kang S. Korea 11-5, 15-9, 15-12.

Grand Prix Badminton Tokyo Dec. Han Jian China won singles vs. Sze Yu Chinese born Australian 15-6, 15-3. Unseeded Sze YU of China bt. world No. 1 Morten Frost of Denmark in semi finals 18-16, 15-11. Women Fin. Li Lingwei of China won womens vs. defending champion Han Aiping 11-3, 11-3.

Alba World Cup: Iuck Sugianto Indonesia bt. Morten Frost Denmark 15-11, 8-15, 15-4. Women: Li Lingwei China bt. Ivana Lie Indonesia 11-3, 11-2.

Asian Badminton Confederation Championship, Kuala Lumpur: Men: Zhau Jian Hua bt. Yung 15-10, 5-15, 15-6. Women: Zheu Yuli bt. Qian Peng 11-6, 12-10.

All England Championship Singles Men: Zhao Jian Hua, Young debutant from China toppled Dane Morten Frost of Denmark 6-15, 15-10, 18-15. Women: Hen Aiping China bt. Li Ling Wei China 11-7, 12-10. Doubles: Men: Park Joo Bong, Korea and Kim Moon Soo. Women: Hen Aiping and Li Lingwei.

National Badminton 1985 March Delhi: Men: Syed Modi Rlys. won for the 5th consecutive year beating Vimal Kumar Kerala 18-17, 15-8. Semi: Syed bt. Partho Ganguly Guj - 15-7, 15-5, Vimal bt. Vikram Singh Gujarat 15-4, 15-8. Doubles: Levoy D'sa and Sanol Misra won beating Uday Pawar and Pradip Gandhe. Women: Madhumita Bist Rlys won beating defending champion Ami Ghia Maharashtra. Interstate: Maharashtra annexed both men and women titles beating Kerala (3-2) and Rlys (5-0) in finals.

142. BASKETBALL

World Championship

Men:

- 1950: 1. Argentina, 2. U.S., 3. Chile.
 54: 1. U.S., 2. Brazil, 3. Philippines.
 59: 1. Brazil, 2. U.S., 3. Chile.
 63: 1. Brazil, 2. Yugoslavia, 3. U.S.S.R.
 67: 1. U.S.S.R., 2. Yugoslavia, 3. Brazil.
 70: 1. Yugoslavia, 2. Brazil, 3. U.S.S.R.
 74: 1. Yugoslavia, 2. U.S., 3. Cuba.
 78: 1. Yugoslavia, 2. U.S.S.R., 3. Brazil.
 82: 1. U.S.S.R., 2. U.S., 3. Yugoslavia.

Women:

- 1954: 1. U.S., 2. Chile, 3. France.
 57: 1. U.S., 2. U.S.S.R., 3. Czechoslovakia.
 59: 1. Brazil, 2. U.S., 3. Chile.
 64: 1. U.S.S.R., 2. Czechoslovakia, 3. Bulgaria.
 67: 1. U.S.S.R., 2. S. Korea, 3. Czechoslovakia.
 71: 1. U.S.S.R., 2. Czechoslovakia, 3. Brazil.
 75: 1. U.S.S.R., 2. Japan, 3. Czechoslovakia.
 79: 1. U.S.S.R., 2. S. Korea, 3. Japan.
 83: 1. U.S.S.R., 2. U.S., 3. China.

Olympics (Gold, Silver and Bronze)

- | | | | |
|---------|----------|------------|------------|
| 1936 | U.S. | Canada | Mexico |
| 48 | U.S. | France | Brazil |
| 52 | U.S. | U.S.S.R. | Uruguay |
| 56 | U.S. | U.S.S.R. | Yugoslavia |
| 60 & 64 | U.S. | U.S.S.R. | Brazil |
| 68 | U.S. | Yugoslavia | U.S.S.R. |
| 72 | U.S.S.R. | U.S. | Cuba |
| 76 | U.S. | Yugoslavia | U.S.S.R. |

- (Women: U.S.S.R. U.S. Bulgaria)
 80 Yugoslavia Italy U.S.S.R.
 (Women: U.S.S.R. Bulgaria Yugoslavia)
 84 U.S. Spain Yugoslavia
 (Women: U.S. S. Korea China)

Asian Games:

- | | | | |
|---------------|-------------|-------------|---------------|
| 1951 | Philippines | Japan | Iran 4. India |
| 54&58 | Philippines | China | Japan |
| 62 | Philippines | Japan | Korea |
| 66 | Israel | Thailand | Korea |
| 70 | Korea | Israel | Japan |
| 74 | Japan | South Korea | China |
| (Women: Japan | Korea | China) | |

- | | | |
|---------------|----------|--------|
| 78 China | S. Korea | Japan |
| (Women: Korea | China | Japan) |
| 82 Korea | China | Japan |
| (Women: China | Korea | Japan) |

Benson & Hedges Malaysian Intl. at Kuala Lumpur Sept. 85 China won vs. Wildcats Australia 104-71. Third place Yugoslav Post-ar bt. Malaysia Reds 79-66. Fifth Britain bt. India 78-68.

13th Asian Basketball, Kuala Lumpur 1. Philippines, 2. South Korea, 3. China.

Nationals. Men: 1934 & 36: Punjab, 38 & 40: Bengal, 44: Punjab, 46 & 48: Mysore, 50: Rajputana, 51: Punjab, 52: Madras, 53-56: Mysore, 57-67: Services, 68: Railways, 69-80: Services, 81: Rajasthan, 82-83: Services.

Women: 1952 & 54: Bengal, 55: Hyderabad, 56-59: Bengal, 60: Mysore, 61: Bengal, 62-64: Mysore, 65-66: Bengal, 67-69: Maharashtra, 70-71: Bengal, 72-73: Delhi, 74: Bengal, 77: Maharashtra, 79-83: Punjab.

35th Natl. at Cuttack Jan. 1985. Punjab men won title for 1st time. Punjab 70 (Sajan 22, Cheema 14, Jagroop 13), Rajasthan 59 (Ramkumar 25, Ajmer Singh 15) 3rd place for Services vs. Railways 69-60. Holders Services failed to figure first time in finals losing semi to Rajasthan 57-66. Punjab to finals vs. Railways 76-60. Kerala women won title for 1st time beating holders Punjab by 19 points. Kerala 64 (Prasannakumari 27, Emily Mathew 15, Capt. Raji Thambi 14) Punjab 45 (Kawaljit 17, Kulwinder 14) 3rd place for Railways vs. Tamil Nadu 71-38.

All India Interzone Basket: Rajasthan 91 (Amar Singh 44) bt. T.N. 63 (Suryashekhar 16).

Pre Asian: Rest of India bt. Services 60-39. 3. Rlys, 4. Rajasthan, 5. Punjab.

Junior National Boys: Maharashtra bt. Kerala 68-59. 3rd place T.N. bt. A.P. 75-61. *Girls:* Kerala bt. Delhi 40-28. 3rd place Mah. bt. Kar. 43-28.

143. BILLIARDS

World Championship at Delhi Aug. 85: 24-year-old Geeth Sethi Mah became youngest ever champ beating 75-year-old four-time champ Bob Marshal Australia 3809-2453 in four sessions 8 hours final. Sethi to finals vs. holder Michael Ferira India 2513-2379. Marshal to final vs. Subhash Agarwal

India 3809-2453. Earlier Sethi with a world record break of 604 bt. Subhash Agarwal.

National Billiards Hyderabad 85 Jan. Geeth Sethi won vs. Subhash Agarwal world No. 2 Snooker also won by Geeth Sethi. Jrs. Yasin Merchant won both Billiards and Snooker.

144. BOAT RACE

Nehru Trophy, Alleppey, Kerala: 1952-Nadubhagom, 54-Kavalam, 55-Parthasarathy, 57-Napoleon, 58-Napoleon and Kavalam, 59-Napoleon, 60-Kavalam, 61-Napoleon, 62-Kavalam, 63-65: Kainakari, 66-67: Pulinkunnu,

68-Kainakari, 69-Pulinkunnu, 70-Kalluparamban and Pulinkunnu, 72-73: Kalluparamban, 74-76: Karichal, 77-78: Jawahar Tayankari, 79: Valiya Divanji, 80-Karichal, 81-abandoned, 82-84: Karichal, 85: Jawahar Tayankari.

145. BOXING

Olympics: Light fly: 1. Paul Gonzalez (USA); 2. Salvatore Todisco (Ita); 3. Jose Marcelline Boliver (Ven). Fly weight: 1. Steven McCrory (USA), 2. Redzep Redzepovski (Yug) 3. Eyup Con (Tur). Bantam weight: 1. Maurizio Stecca (Ita); 2. Hector Lopez (Mex), 3. Dale Walters (Can). Feather-weight: 1. Meldrick Taylor (USA); 2. Peter Konyewachie (Nig) 3. Turgut Aykac (Tur). Light Weight: 1. Permell Whitaker (USA) 2. Luis Artiz (Pur) 3. Martin Ndongo Ebenga (Nig). Light welter weight: 1. Jerry Page (USA) 2. Dhawee Umponmaha (Tha) 3. Mircea Fluger (Rom). Welter weight: 1. Mark Breland (USA) 2. Young-su An (Kor) 3. Joni Nywan (Fin) Light middle weight: 1. Frank Tate (USA), 2. Shawn O'Sullivan (Can) 3. Manfred Zielonka (FRG). Middle weight: 1. Moon-sup Shin (Kor), 2. Virgil Hill (USA), 3. Mahmoud Zaoui (Alg). Light heavy weight: 1. Arton Josipovic (Yug), 2. Kevin Barry (NZ) 3. Mustapha Moussa (Alg). Heavy-weight: 1. Henry Tillman (USA), 2. Wilbie Dewitt (Can), 3. Angelo Musone (Ita) and Arnold Vanderliden (Hol). Super heavy-weight: 1. Tyrrell Higgins (USA) 2. Francesco Damiani (Ita) 3. Robert Wells (GBR) and Salihu Azis (Yug).

Asiad 1982, Delhi: Light Fly: Hiyo Yougmo, Korea. Fly: S. Tita Pon, Thailand. Bantam: Moon Sung Gill, Korea. Feather: Yoryon Sic, DPR Korea. Lt. wt.: Chong Jo Ung, DPR Korea. Lt. Welter: Kim Dong Kil, Korea. Welter: Chung Yan Biyon, Korea. Lt. Middle: Litti Jung, Korea. Middle: Linam Yugi, Korea. Lt. Heavy: Hong Ki Hoe, Korea. Heavy: Kaur Singh, India. Super heavy: Chowheng Grill, DPR Korea.

WBC Featherweight: Azumah Nelson, Ghana successfully defended his World Boxing Council (WBC) featherweight championship for first time with a fifth-round knock-out of Juneval Ordenes of Chile in Miami, September, 1985.

WBC Super-bantamweight: Mexican Guadalupe Pintor grabbed from countryman Juan "Kid", Meza Mexico City August 8, 1985.

WBC Bantamweight: Colombian Miguel "Happy" Lora took title from Daniel Zaragoza Mexico with a unanimous 12-round decision, Miami August, 1985.

WBC Light Heavyweight: Michael Spinks retained title in Las Vegas, June 1985

National Games 85 Dec. Delhi: Light fly 1. S. Bhiraajdar, Mah. 2. J. S. Prabhu, Kar. Fly: 1. Dhanasanjayan, Kar. 2. D. Hansda Bih. Bantam: 1. G. D. Kamble, Bihar, 2. Albinder Singh, Orissa. Feather: 1. D. P. Bhatt, Delhi, 2. K. Saha, Bengal. Light: 1. D. K. Medappa, Kar, 2. Ram Avtar, U.P. Lt. Welter: 1. S. Jayaram,

M.P. 2. S. Sasane, Mah. Welter: 1. D. Gewang, Mah 2. Ranjit Singh, Pun. Light middle: 1. M. P. Singh, Mah, 2. P. Karunakaran, T.N. Middle: 1. Satanam Singh 2. R. K. Baradwaj, T.N. Light heavy: 1. Palwinder Singh, Pun. 2. S. S. Sangwan, Haryana. Heavy: 1. Mohd Razaqui, Rj., 2. C. Bhasker Sen, T.N.

146. CHESS

World Chess. Moscow: Nov. 10, 85 Garry Kasparov of USSR at 22 became world's youngest chess champion 13-11 vs. compatriot Anatoly Karpov in a gruelling five and a half month tilte series. Kasparov reigned 10 years.

Asian Womens Chess, Dhaka: 16 year old Anupama Abhyanker, India won beating nine of her opponents including National Champ Bhagyasree Sathe. 2. Ning Chun Hon, China 3. Rani Hamid, Bangladesh.

Federation Cup Intl. masters Chess Delhi

Jan. 86. Soviet Grand master Evgey Vasyukov, 2. Hasan, 3. Prasad and Vaidya.

National Womens Chess 86 Jan. Jalundhar: Bhagyasree Sathe, Mah. retained scoring new record of nine points in a possible nine., 2. Rohini Khadilkar, Mah, 3. Kiran Agarwal, M.P., 4. A. V. Nirmala, T.N.

National Junion Chess 86 Jan. Calicut. Intl. Master Dibyendu Barua Bengal won all nine points, 2. V. Anand, T.N. 7½ points, 3. P. Manoj Kumar, Kerala 7 points.

147. CRICKET

World Cricket for Prudential Cup 1975 in London: West Indies beat Australia by 17 runs in finals. In 1979, in London West Indies beat England by 92 runs in finals. In 1983 in London India beat last two years holders West Indies by 43 runs in finals. Semi Finals: India beat England by six wickets. West Indies beat Pakistan by eight wickets. Final: On June 25, 1983 India under Kapildev 183 in 54.4 overs (K. Srikanth 38, Sandip Patil 27, Mohinder Amarnath 26 — Andy Roberts 3 for 32). Windies under Clive Lloyd 140 in 52 overs (Viv Richards 33, P. D. Dujon 25. M. Amarnath 3/12, Madanlal 3/31).

World Championship Cricket at Melbourne, 10th March 1985. India under Kapil Dev won finals beating Pakistan under Javed Miandad by 8 wickets. Pak 176 for 9 in 50 overs (J. Miandad 48, Imran Khan 35 — Kapildev 23/3, Sivaramakrishnan 35/3) Third place West Indies bt. New Zealand by six wickets. Semi: India bt. N.Z. and Pak bt. Windies. Result summary: India won all 5 matches, Pak won 3 lost both to India W.I. lost to Pak, N.Z. lost to India and W.I., Aus lost to India and Pak. Eng. lost to Aus. India and

Pak, Sri Lanka lost to N.Z. and W.I.

Rothmans Cup Cricket Sharjah Nov. 85 Windies under Viv Richards won beating Pak and India. Windies beat Pak by 4/196 in 45 (Mohsin Khan n.o. 86) Windies 3/199 in 44.1 (Richie Richardson n.o. 99) Pak beat India by 48 runs Pak 4/203 in 45 (Mudassar 67, Rameez Raja 66) India. 155 (Gavaskar 63-Tauseef 30/3).

Windies beat India by 8 wkts. India 4/18 (Gavaskar n.o. 76, Azheer 55. Kapil n.o. 28 Windies 2/186 in 41.3 (Haynes 72 n.o. Richardson 24 n.o.).

TEST MATCHES

India in Tests

Against	Played	Won	Lost	Draw
England	72	9	30	33
Australia	42	8	20	14
W. Indies	54	5	22	27
Pakistan	35	4	6	25
Newzeland	22	8	4	10
Sri Lanka	4	0	1	3

'Boy wonder' Mohamed Azharuddin of Hyderabad became first ever cricketer to score three centuries in a row in his first three tests all before he turned 22 against England in India — 1985.

Sunil Gavaskar playing in the first test against Australia in Dec. 1985 at Adelaide added yet another to his 30 test hundreds after waiting for 10 tests and almost two years. Crossing 9000 runs in 110 tests, left Sobers and Boycott far behind at 8000.

India under Kapildev in Aussies 1985 November 85 – Jan. 86 drew all three tests against Allan Border's team. Man of the Series: Kapildev & Srikanth. I. Adelaide drawn Aus 381 (Greg Ritchie 128, David Boon 123 - Kapil 106/8). Ind 520 (Gavaskar n.o. 166 - Bruce Reid 113/4) II Melbourne rain halted play at tea. Drawn. Aus 262 (G. Mathews n.o. 100 - Shastri 87/4, Yadav 64/3) & 308 (Border 163 - Shastri 92/4, Yadav 84/3) Ind 445 (Srikanth 86, Vengsarkar 75, Kapil 55 - Reid 92/3) & 2/59 (Srikanth 59 - Reid 23/2) III Sydney Drawn. Ind 4/600 decl. (Gavaskar 172, M. Amarnath 138, Srikanth 116 - Gilbert 135/2), Aus. 396 (Boon 131, Marsh 92, Border 11, - Yadav 99/5, Shastri 101/4) & 6/119 (Marsh 28, Phillips 22 - Yadav 19/3, Shastri 36/2).

India under Kapildev in Sri Lanka Aug.-Sept. 85 lost one nil in three test series. I. Colombo drawn India 218 (Gavaskar 51 - A. Demel 64/5) and 251 (Vengsarkar 98 n.o. L. Rajput 61 - Ramesh Ratnayake (85/6) Sri Lanka 347 (R. Madugale 103, A. Ranatunge 111, D. Mendez 51 - Kapil 74/3 Chetan Sharma 81/3) and 61/4.

II. Colombo Lanka won by 149 runs. Lanka 385 (Amal Silva 111, Roy Dias 95 - Sharma 18/5) and 206/3 decl. (A. De Silva 75, R. Dias 30 n.o.) India 244 (Srikanth 64, Amarnath 60, Gavaskar 52 - R. Ratnayake 76/4, Ahangama 19/3 and 198 (Kapil 78 - Ratnayake 49/5, Demel 64/3).

III. Kandy drawn. India 249 (Vengsarkar 62, Ahangama 52/5) and 325/5 decl. (Amarnath 16 n.o., Shastri 81 - Ahangama 72/3), Lanka 92 (Mendez 53-Maninder 31/4) and 307/7 (D. Mendez 124, R. Dias 106, Sharma 65/3, Kapil 4/3).

Pak under J. Miandad in New Zealand Jan.-Feb. 85, lost two nil in three test series.

New Zealand under G. P. Howarth in

Windies Mar.-May, 85 lost two-nil in four test series.

New Zealand in Australia won three test series 2-1.

England in India under David Gower 84-85 bt. India under Gavaskar two-one in five test series. Sunil Gavaskar retires from Captaincy, Mohamed Azharuddin of Hyderabad becomes first ever cricketer to score three centuries in a row in debut, Lakshman Sivaramakrishnan emerges as the new find of leg spin bowling.

I. *Bombay* Dec. 3/84 India won by 8 wickets and broke 31 test drought of victory. Eng. 195 (P. J. Edmonds 48, M. W. Gatting 45 — Sivaramakrishnan 64/6) and 317 (M. W. Gatting 136, P. R. Downton 62, G. Fowler 55 — Sivaramakrishnan 117/6) India 465/8 decl. (R. J. Shastri 142 SMH Kirmani 102 — P. I. Pocock 133/3) and 52 for 2.

II. *New Delhi* Dec. 17/84 Eng. won by 8 wickets. India 307 (Kapildev 60, M. Amarnath 42 — R. M. Ellison 66/4, Pocock 70/3) and 235 (Gavaskar 65, M. Amarnath 64 — Edmonds 60/4, Pocock 93/4) Eng. 418 (R. T. Robinson 160, P. R. Downton 74 — Sivaramakrishnan 99/6) and 127/2 (A. J. Lamb n.o. 37).

III. *Calcutta* Jan. 5/85 drawn. India 7/437 decl. (R. J. Shastri 111, M. Azharuddin 110 — Edmonds 72/3, Cowans 103/3) and 29 for 1 Eng. 276 (A. J. Lamb 67 - Chetan Sharma 38/4, Shivlal Yadav 86/4).

IV. *Madras* Jan. 18/85. Eng. won by 9 wickets. India 272 (M. Amarnath 78, Kapildev 53, Azharuddin 48 - Foster 104/6, Cowdrey 65/2) and 412 (Azharuddin 105, Amarnath 95, Kirmani 75 - Foster 59/5) England 652/7 decl. (Gatting 207, G. A. Fowler 201, R. T. Robinson 74 - Amarnath 36/2) and 35 for one.

V. *Kanpur* Feb. 5/85. Drawn India 553/8 decl. (Vengsarkar 137, Azharuddin 122, K. Srikanth 84 - Foster 123/3) and 97 for one (Azharuddin n.o. 54).

Aussies under Allan Border in England against England under David Gower Jun.-Sept. 85 Eng. won ashes 3-1 in six tests.

I. *Leeds* Eng. won by 5 wickets. Aus. 331 (AMJ Hilditch 119 - I. T. Botham 86/3) and 324 (W. B. Phillips 91, Hilditch 80, K. C. Wessels 64 - Emburey 82/5, Botham 107/4) Eng. 533 (R. T. Robinson 175, Botham 60, P. R. Downton 54 M.W. Gatting 53 - McDermott 134/4, G.F. Lawson 174/3) and 123/5 (A. L. Lamb n.o. +

S.P.O'Donnell 37/3).

II. Lords Aus. won by 4 wickets Eng. 290 (D. I. Gower 86, Lamb 47 - McDermott 76/6, Lawson 91/3) and 261 (Botham 85, Gatting n.o. 75 - R. G. Holland 68/5, Lawson 86/3) Aus. 425 (Border 196, G. M. Ritchie 94 - Botham 109/5) and 127/6 (Border n.o. 41).

III. Nottingham drawn. Eng. 456 (Gower 166 Gatting 74, Gooch 70 - Lawson 103/5) and 196/2 (Robinson n.o. 77) Aus. 539 (G. M. Wood 172, Ritchie 146, — Botham 107/3, Emburey 129/3).

IV. Manchester Drawn. Aus 257 (D. C. Boon 61 - Botham 79/4, Edmonds 40/4) and 340/5 (Border 146 n.o. - Emburey 99/4) Eng. 482/9 decl. (Gatting 160 Gooch 74, Lamb 67 - McDermott 141/8).

V. Birmingham Eng. won by innings and 118 Aus. 335 (Wessels 83, Lawson 53 - Ellison 77/6) and 142 (W.B. Philips 59 - Ellison 27/4) Eng. 595/5 decl. (Gower 215, Robinson 148, Gatting n.o. 100).

VI. Oval Eng. won by innings and 94 Eng. 464 (Gooch 196, Gower 157 - Lawson 101/4), McDermott 108/4) Aus. 241 (Ritchie n.o. 64 - Botham 64/3) and 129 (Border 58 - Ellison 46/5, Botham 44/3).

In the Eng-Aus. Ashes Series 257 tests were played. Eng. won 86 and Aus. 96. Played in Australia 134, Eng. won 49-66 with 19 draws. Played in England 123 Eng won 37-30 with 56 draws.

1984 Nov.-Dec. N.Z. in Pak lost series 0-2. First test Lahore N.Z. 157 and 241 lost to Pak 221 + 181/4 by six wickets. Second test at Hyderabad, Sind N.Z. 267 + 189 lost to Pak 230 + 230 by 7 wkts. Final test at Karachi Pak 329 - 307/5, N.Z. 426 drew.

1984-85 Windies under Clive Llyod in Australia I. Perth: W.I. 416 bt. Aus 76 + 228 by innings and 112 runs. II Brisbane: Aus 175 + 271 lost to W.I. 424 + 26/2 by 8 wkts. III. Adelaide: W.I. 356 + 292 for 7 decl. drew. Australia 284 + 173. IV. Melbourne: W.I. 479 + 186/5 decl. drew. Aus. 296 + 198/8. V Sydney: Aus 471 bt. W.I. 163 + 253 Clive Llyod retires from Cricket.

Ranji Trophy: National Cricket Championship is being conducted since the last 51 years for Ranji Trophy. Kumar Shri Ranjit Singhji (1872-1933) Jamsahab of Nawanagar, Gujarat, was a wizard of the willow game.

Ranji: Bombay's World Record

Bombay won Ranji Trophy Cricket 30 times, with 15 in a row from 1959 to 73, a world record in national championships of any cricketing nation. The second most winner was Baroda and Holkar both four times each.

Highest so far: 912 for 8 by Holkar v. Mysore at Indore in 1946 and the lowest 22 by Southern Punjab v. Northern India at Amritsar in 1935. Highest individual 443 n.o. at Pune in 1948 by B. B. Nimbalkar for Maharashtra vs. Kathiawar.

All ten wickets in an innings by P. Chatterjee, of Bengal vs. Assam at Jorhat in 1956. 24 year old Rajasthan medium pacer Pradeep Sundaram took all 10 wickets in first innings and six in second against Vidharbha in Ranji Trophy in Dec. 1 85 at Jodhpur to mark 16 wickets in a match.

P. Chatterjee for Bengal vs. M. P. 1955 and S. Gupta for Bombay Vs. Vidharbha 1961 were the 15 wickets record makers.

Rusy Mody's seven consecutive centuries for Bombay in the two seasons of 1943-45 will be hard to surpass. Ravi Shastri playing for Bombay against Baroda in Ranji on Jan. 9/85 scored all six balls of spinner Tilak Raj to sixers to equal 1968 world record of Gary Sobers of West Indies. Shastri hit 13 sixes highest n.o. of sixes in an innings. His was fastest hundred and fastest double century off 123 balls in 113 mnts.

Nicknamed as Run-get-Singji, in England in 1900 he amassed 3065 runs (average 87.57). His total was 24,567 runs, (average 45) and scored 72 centuries. He played for England against Australia and scored century on debut inspiring many including his nephew Duleep Singhji, who also scored a test hundred on debut.

Ranji Trophy Winners: 1935 and 36 Bombay, 37 Nawanagar, 38 Hyderabad, 39 Ben

gal, 40 & 41 Maharashtra, 42 Bombay, 43 Baroda, 44 W. India, 45 Bombay, 46 Holkar, 47 Baroda, 48 Holkar, 49 Bombay, 50 Baroda, 51 Holkar, 52 Bombay, 53 Holkar, 54 Bombay, 55 Madras, 56 & 57 Bombay, 58 Baroda, 59-73 Bombay, 74 Karnataka, 75-77 Bombay, 78 Karnataka, 79 & 80 Delhi, 81 Bombay, 82 Delhi, 84 Karnataka, 84 & 85 Bombay.

Final at Bombay Apr. 85. Bombay won for 30th time under S. M. Gavaskar beating Delhi under Madanlal by 90 runs. Bombay 333 (Gavaskar 106, Sandip Patil 54, C. S. Pandit 49 - Madanlal 42/4, Maninder Singh 75/3) and 7/364 decl (Ravi Shastri 76, Gavaskar 64, Lalchand Rajput 63 - Maninder 132/4) Delhi 398 (Ajay Sarma 131, Chetan Chauhan 98, S. Madanlal 78 - Raju Kulkarni 106/5, Ravi Shastri 91/4) and 209 (Bhaskar Pillai 60, Chauhan 54, Manoj Prabhakar 44 - Ravi Shastri 91/8).

Irani Cup for the Ranji Champions vs. the Rest 1960 Bombay, 61 and 62 no match, 63 and 64 Bombay, 65 no match, 66 Rest, 70 & 71 Bombay, 72 Rest, 73 Bombay, 74 Rest, 75 Karnataka, 76 & 77 Bombay, 78 & 79 Rest, 80 Abandoned, 81 Deen, 82 Bombay, 83 Rest, 84 Karnataka, 85 Bombay.

Highest total Delhi 628 in 78. Lowest rest 83 vs. Bombay in 64. Individual highest 235 n.o. by Surinder Amarnath for Delhi in 1980-81. Best bowling 9 for 101 by Ravi Shastri for Bombay in 80-81.

1985—Finals at Nagpur. Bombay 472 (C. S. Pandit 123, Ravi Shastri 112, Raju Kulkarni 97

- G. S. Ghai 130/6) and 400 (S. Hattangadi 85, Vengsarkar 83, Sandip Patil 78, Ravi Shastri 68 - Sivaramakrishnan 132/3) bt. Rest 312/9 decl. (M. Azharuddin n.o. 100, Kapil 70, Ashok Malhotra 52 - Shastri 68/4, Kulkarni 93/3 and 342/7 (K. P. Bhaskaran Pillai 103 n.o., M. Prabhakar 74 - Mokashi 101/4) on first innings lead.

Duleep Trophy Interzonal 1962-65 West 66-68 South, 69 & 70 West 71 South 72 Central 73 West, 74 North 75 & 76 South 77 & 78 West 79 & 80 North 81 & 82 West 83 & 84 North 85 South.

Highest individual 229 by Ajit Waddekar for West vs. Rest 64-65. Highest wickets: 9 for 55 by Balu Gupta for West vs. South 62-63.

85 finals in Oct. West bt. South by 9 wickets. S.Z. 305 (Roger Binny 115, Ranjit Kan Wilkar 98 - Ashok Patel 86/4) and 236 (K. Srikanth 120 - A. Patel 95/4) W.Z. 453 (Vengsarkar 147, Gavaskar 119 - Yadav 110/6) and 89 for 1 (Gavaskar 44).

Wills Trophy limited over cricket 83-84 Board Presidents XI bt. Karnataka 84-85 Qr. finals T.N. 202/8 in 50 overs lost to Bombay 204/7 in 46.5. Bengal 233 in 48.2 bt. Haryana 108 in 34.3. U.P. 181/9 lost to Wills XI 182/5 in 46.5. Semi: Pres. XI 247/7 in 49 bt. Bengal 158 in 43.5. Bombay 216/9 in 48 lost to Wills XI 219/9 in 47.1 Final at Bombay: Pres XI 249 in 49.4 (Padam Shastri 102 - Amshuman Gaekwad 42/4 lost by 6 wickets to Wills XI 252/4 in 46.1. (Gaekwad 87, Surinder Khanna 50).

148. FOOTBALL

World Cup

1930	Uruguay 4	Argentina	2
1934	Italy 2	Czechoslovakia	1
1938	Italy 4	Hungary	2
1942	No matches held		
1946	No matches held		
1950	Uruguay 2	Brazil	1
1954	W. Germany 3	Hungary	2
1958	Brazil 5	Sweden	2
1962	Brazil 3	Czechoslovakia	1
1966	England 4	W. Germany	2
1970	Brazil 4	Italy	1
1974	W. Germany 2	Poland	1
1978	Argentina 3	Holland	1

1982 World Cup held in Spain.

Semifinal results: Italy 2, Poland 0; W. Germany 5, France 4, Finals: Italy 3, W. Germany 1. —Third place—won by Poland beating France 3-2.

1986 World Cup is to be held in 1986 in Mexico city.

Olympics

1904: Denmark. 1908: 1. Britain 2. Denmark 3. Holland. 1912: 1. Britain 2. Denmark 3. Holland. 1916: No games. 1920: 1. Belgium, 2. Czechoslovakia 3. Holland. 1924: 1. Uruguay, 2. Switzerland, 3. Sweden. 1928: 1. Uruguay, 2. Argentina, 3. Italy. 1932: Football not held. 1936: 1. Italy, 2. Austria, 3. Norway. 1940 & 44 No games. 1948: 1. Sweden, 2. Yugoslavia, 3.

Denmark. 1952: 1. Hungary, 2. Yugoslavia, 3. Denmark. 1956: 1. Yugoslavia, 2. Denmark, 3. Hungary. India was placed fourth. 1960: Yugoslavia. 1964: 1. Hungary, 2. Czechoslovakia, 3. West Germany (FRG.); 1968: 1. Hungary, 2. Bulgaria, 3. Japan. 1972: 1. Poland, 2. Hungary, 3. East Germany. 1976: East Germany (GDR), 2. Poland, 3. USSR. 1980: 1. Czechoslovakia, 2. E. Germany, 3. USSR.

1984 at Los Angeles in August, France won finals vs. Brazil 2-0. Francois Bisson and Daniel Zurele scored. Bronze medal for Yugoslavia vs. Italy 2-1. Semi: France 4 Yugoslavia 2; Brazil 2; Italy 1. Qr. Finals: France 2, Egypt 0; Italy 1, Chile 1; Yugoslavia 5, W. Germany 2; Brazil 5, Canada 3.

India failed to qualify for 1984 Olympics too. Past records are 1948 London under T. Aao lost to France 1-2 1952 Helsinki under S. Manna lost to Yugoslavia 1-10, 1956 Melbourne under S. Banerjee reached semi and lost to Yugoslavia 1-4. 1960 Rome under P.K. Banerjee drew France 1-1, lost to Peru 1-3.

Asian Games Football 1951 Delhi. 1. India 2. Iran. 3. Japan. 54 Manila 1. Tawwan 2. Korea. 3. Burma 58 Tokyo 1. China 2. Korea 3. Indonesia. 62 Jakarta 1. India 2. S. Korea. 3. Malaysia. 66 Bangkok: 1. Burma 2. Iran 3. Japan. 70 Bangkok: 1. Burma and Korea shared 3. India. 74 Teheran: 1. Iran 2. Israel 3. Malaysia. 78 Bangkok: 1. S. Korea and N. Korea shared 3. China. 82. Delhi: 1. Iraq 2. Kuwait 3. Saudi Arabia.

8th Asian Cup Football at Singapore in Dec. 1984. Saudi Arabia won vs. China 2-0. 3rd place. Kuwait bt. Iran 6-4, Semi: Saudi 6, Iran 5; China 1 Kuwait 0. India placed last in Pool B with a single draw against Iran 0-9; lost to China 0-3, UAE 0-2, and Singapore 0-2.

Former champs: 1956 at Hongkong: S. Korea bt. Israel. 60 S. Korea bt. Israel. 64 Israel bt. India. 68 Iran bt. Burma. 72 Iran bt. S. Korea. 76 Iran bt. Kuwait. 80 Kuwait bt. S. Korea.

World Youth Soccer at Moscow Sept. Brazil bt. Spain 1-0 in extra time. 3rd place Nigeria bt. Soviet Union 3-1 in tie breaker.

Inter Continental Football Aug. in Paris. France bt. Uruguay 2-0.

World Champs Club Football 1984 Dec. at Tokyo. South American Champs Independen-

dent Argentina regained beating European Champions Liverpool of England 1-0.

English F.A. Cup final. Manchester United bt. Everton 1-0 in extra time.

Merdeka at Kuala Lumpur 85 Aug. S. Korea bt. America Club, Brazil 7-4 after extra time.

SANTOSH TROPHY

Year	Winners	Runners-up	Venue
1941	Bengal	Delhi	Calcutta
1942-43		Not held	—
1944	Delhi	Bengal	Delhi
1945	Bengal	Bombay	Bombay
1946	Mysore	Bengal	Bangalore
1947	Bengal	Bombay	Calcutta
1948		Not held	—
1949	Bengal	Hyderabad	Calcutta
1950	Bengal	Hyderabad	Calcutta
1951	Bengal	Bombay	Bombay
1952	Mysore	Bengal	Bangalore
1953	Bengal	Mysore	Calcutta
1954	Bombay	Services	Madras
1955	Bengal	Mysore	Ernakulam
1956	Hyderabad	Bombay	Trivandrum
1957	Hyderabad	Bombay	Hyderabad
1958	Bengal	Services	Madras
1959	Bengal	Bombay	Nowgong
1960	Services	Bengal	Calicut
1961	Railways	Maharashtra	Bombay
1962	Bengal	Mysore	Bangalore
1963	Maharashtra	Andhra	Madras
1964	Railways	Bengal	Gauhati
1965	Andhra	Bengal	Quilon
1966	Railways	Services	Hyderabad
1967	Mysore	Bengal	Calcutta
1968	Mysore	Bengal	Bangalore
1969	Bengal	Services	Nowgong
1970	Punjab	Mysore	Madras
1971	Bengal	Railways	Madras
1972	Bengal	Tamil Nadu	Panaji
1973	Kerala	Railways	Cochin
1974	Punjab	Bengal	Jullundur
1975	Bengal	Karnataka	Calicut
1976	Bengal	Maharashtra	Patna
1977	Bengal	Punjab	Calcutta
1978	Bengal	Goa	Srinagar
1979	Bengal	Punjab	Coimbatore
1980	Punjab	Railways	Cuttack
1981-82	Bengal	Railways	Trichur
1983	Bengal	Goa	Calcutta
1984	Goa	Punjab	Madras
1985	Punjab	Maharashtra	Kanpur

41st National at Kanpur Punjab bt. Maharashtra 3-0 (Parminder 2 Darshan Singh 1) Semi: Maha 1, A.P.O.; Punjab 3, Services 0.

Dr. B.C. Roy Trophy Junior National Football Winners. 1962 Bengal, 63 Delhi and Mysore, 64 Rajasthan, 65 Delhi, 66 Andhra, 67

Sports: Fastest, Youngest

Fastest: The highest speed reached in non-mechanical sports is in sky-diving, in which a speed of 185 mph/298 kmh is attained in a head-down free falling position, even in the lower atmosphere.

Slowest: In wrestling, before the rules were modified towards "bright wrestling", contestants could be locked in holds for so long that a single bout once lasted for 11 hr. 40 min.

Youngest Record Breaker: The youngest age at which any person has broken a non-mechanical world record is 12 yr 298 days for Gertude Caroline Ederle (US) b. October 23, 1906) who broke the women's 880-yd freestyle swimming world record with 13 min 19.0 sec at Indianapolis, Indiana, Aug. 17, 1919.

Oldest Record Breaker: Gerhard Weidner (W. Germany) (b. Mar 15, 1933) set a 20 Mile Walk record on May 25, 1974, aged 41 yr 71 days.

Youngest Champion: The youngest individual Olympic winner was Marjorie Gestring (US) (b. Nov. 18, 1922), who took the springboard diving title at the age of 13 yrs. 268 days at the Olympic Games in Berlin, Aug. 12, 1936.

Oldest Champion: Oscar Gomer Swahn (Sweden) (1847-1927) was aged 64 yr 258 days when he won a gold medal in the 1912 Olympic Running Deer team shooting competition.

Most Versatile: Charlotte "Lottie" Dod (1871-1927) won the Wimbledon Single Tennis title five times between 1887 and 1893, the British Ladies Golf Championship in 1904, an Olympic silver medal for archery in 1908, and represented England at hockey in 1899. She also excelled at skating and tobogganing.

Most Prolific Record Breaker: Between Jan 24, 1970 and Nov. 1, 1977 Vasili Alexeyev (USSR) (b. Jan. 7, 1942) broke 80 official world records in weightlifting.

Longest Reign: The longest reign as a world champion is 33 yrs (1829-62) by Jacques Edmond Barre (France) (1802-73) at real tennis.

Heaviest Sportsman: The heaviest sportsman of all-time was the professional wrestler William J. Cobb of Macon, Georgia, who in 1962 was billed as the 802-lb/363 kg "Happy Humphrey".

Greatest Earnings: The greatest fortune amassed by an individual in sport is an estimated \$69 million by the boxer Muhammad ali Haj (US) in 1960-81. The highest paid woman athlete in the world is tennis player Martina Navratilova (b. Prague, Czechoslovakia, Oct, 1956) Who had career tournament earnings of \$6, 113, 756 till September 1983.

Largest Crowd: The great number of live spectators for any sporting spectacle is the estimated 2,500,000 who annually line the route of the New York Marathon. However, spread over 23 days, it is estimated that more than 10,000,000 see the annual Tour de France along the route.

Most Sportsmen: According to a report in 1978, 55 million people are active in sports in the USSR. The country has 3,282 stadiums, 1,435 swimming pools and over 66,000 indoor gymnasia. It is estimated that 29 per cent of the population of East Germany Participate in sport regularly.

Worst Disasters: The worst sports disaster in recent history was when an estimated 604 were killed after some stands at the Hong Kong Jockey Club racecourse collapsed and caught fire on Feb. 26, 1918.

Bengal, 68 Bengal, 69 Orissa and Kerala, 70 Bengal, 71 Bengal, 72 Kerala, 73 Kerala, 74 Bengal, 75 Bengal, 76 Andhra, 77 Bengal, 78 Bengal, 79 Karnataka, 80 Goa, 81 Railways & Bengal, 82 Bengal, 83 Goa, 84 Bengal, 85 at Caltutta Bengal won vs. Assam 3-1.

Mir Iqbal Husain Trophy National. Sub Junior Football 1977 Bengal and Manipur, 1978 Karnataka, 1979 Assam, 1980 Assam, 1981 Assam and Kerala, 1982 Kerala, 83 Kerala beat Bengal 2-0, 84 T.N. and Bengal shared, 85 Karnataka bt. Manipur 1-0. Semi.

Karnataka 4, Bihar 1; Manipur 4 Bengal 2. *Nehru Cup International Football* 1982 at Calcutta: Uruguay 2 China 0, 1983 at Cochin Hungary 2 China 1, 1984 at Calcutta Poland 1, China 0. 1985 at Cochin: Soviet Union 2 Yugoslavia 1.

Federation Cup Football conducted by AIFF for the champion teams of the country. 1977 at Cochin ITI Bangalore bt. Mohun Bagan Calcutta 1-0, 78 at Coimbatore: Mohun Bagan and East Bengal shared 0-0. 79 at Gauhati: BSF Jalandhur bt. Mafatlal Bombay 3-0, 80 at Calcutta: Mohun Bagan and East Bengal shared 1-1. 81 at Madras: Mohun Bagan bt. Mohd. Sptg. 2-0. 82 at Calicut: Mohun Bagan bt. Mafatlal 1-0, 83 Cannanore: Mohd. Sptg. bt. Mohun Bagan 2-0. 84 at Tiruchi Mohd. Sptg. bt. East Bengal 1-0. 85 at Bangalore: East Bengal bt. Mohun Bagan 1-0. Jamshed Nas-

siri scored in extra time. Semi: Began bt Salgaokar 5-4 (0-0; 1-1; 4-3 in tie breaker), East Bengal bt. Punjab State Elec. Board 2-1 (2-0, 0-1).

Durand Cup Delhi 1984 Nov. Mohun Bagan bt. JCT 3-2 in tie breaker. *IFA Shield Calcutta* Dec.85 Penarol Uruguay won vs. Shakhtjor Russia 1-0. *Rovers Cup Bombay* 85 Nov. Mohun Bagan 2 Salgaokar 0. *DCM Delhi* 85 Dec. South Australia Soccer Fedn. bt. East Bengal 5-4 in sudden death penalties. *Nagjee Calicut* East Bengal Calcutta won vs. Kerala XI 2-0. *Gurkha gold cup Darjeeling* East Bengal 1 Md. Sptg 0. *Vittal Trophy Madras*: Malaysian Indian India Football Association won vs. State Bank of India Madras 4-2 in tie breaker. *Bordolai Trophy Guahati*: Md. Sptg 1 Salgaoker 0. Madura Coats centenary JCT 1 Dempo 1.

149. GYMNASTICS

World Gymnastics 1985 Soviet Union regained men and women team titles.

Olympics. China, who beat USSR in the 83 World Championships, lost to new entrants USA (591.40 pts) by just 0.60 pts. Romania made most of the Soviet absence and won Womens Title.

Men: Team: 1. USA (591.40); 2. China (590.80); 3. Japan (586.70) Ind. all-around; 1. Koji Gushiken (Jpn) 118.700; 2. Peter Vidmar (USA) 3. Li Ning (Chn), Floor Exercise: Li Ning (Chn) 19.925; 2. Lou Yun (Chn), 3. Koji Sotimura (Jpn) and Philippe Vatuoune (Fra) Pommel Horse; 1. Li Ning (Chn) and Peter Vidmar (USA) 19.950 3. Timothy Daggert (USA). Roman rings: 1. Koji Gushiken (Jpn) 19.950 and Li Ning (Chn) 3. Mitchell Gaylord (USA) Vaulting horse: 1. Lou Yun (Chn) 19.950; 2. Li Ning (Chn); 3. Koji Gushiken (Jpn) Mitchell Gaylord (USA) and Shinje Morisu (Jpn) - all with 19.825. Parallel bars: 1. Bart Corner (USA) 19.950; 2. Nobujuki Kajitani (Jpn), 3. Mitchell Gaylord (USA) Horizontal

bar. 1. Shinji Morisue (Jpn) 20.000; 2. Tong Fei (Chn) 3. Koji Gushiken (Jpn).

Women: 1. Romania (392.20) 2. USA (391.20) 3. China (388.60). Ind. all-round: 1. Mary Lou Retton (USA) 79.175; 2. Ecaterina Szabo (Rom) 79.125; 3. Simona Pauca (Rom) 78.675 Vaulting horse: Szabo (Rom) 19.875; 2. Retton (USA) 3. Lavinia Agache (Rom). Uneven Bars 1. Me Yanhong (Chn) and Juliane McNamara (USA) 19.950; 3. Retton (USA) Balance Beam: 1. Pauca (Rom) and Szabo (Rom) 19.800; 3. Kathy Johnson (USA). Thythmics: 1. Lori Fung (Can) 57.950; 2. Doina Sticulescu (Rom) 3. Regina Webber (FRG)

28th National Gymnastics at Bangalore 85 January. Men: 1. Railways 483 pts. 2. Chandigarh 453.3, Services 419. Women: 1. Haryana 282.2. Maharashtra 262.3 W. Bengal 210.

National School Games Gymnastics 1985 January at Trivandrum Boys: 1. Bengal; Maharashtra. Individual Boys: Debansu Das Bengal, Girls: Kripali Patel Gujarat.

150. HANDBALL

13th Handball National Quilon 85 Feb. Men: 1. Indian Air Force won Seth Chand Trophy for 9th time in a row. 2. A.P. 3. Punjab.

4. J & K. Women: Punjab won Seth Manu Chand Trophy beating holders Maharashtra 3. W. Bengal. 4. A.P.

151. HOCKEY

World Cup Hockey: 1971 at Barcelona 1. Pak, 2. Spain, 3. India. 73 Amsterdam: 1. Holland, 2. India, 3. W. Germany. 75. Kulaumpur: 1. India, 2. Pak, 3. W. Germany. 78. Buenos Aires: 1. Pak, 2. Holland, 3. Australia. 82 Bombay: 1. Pak, 2. W. Germany, 3. Australia.

Olympics. 1908 Great Britain, 12 Great Britain, 28 India, 32 India, 36 India, 48 India, 52 India, 56 India, 60 Pakistan (2nd place for India), 64 India, 68 Pakistan (India lost in semi to Australia), 72 W. Germany (India lost to Pakistan in semi, Bronze for India beating Holland), 76 New Zealand (Seventh place for India), 80 India won final vs. Spain 4-3 (New Zealand, Australia, Pakistan, W. Germany, & Holland did not participate).

1984 at Los Angeles: Pak regained after 16 years beating W. Germany 2-1. Britain inducted as substitute for USSR took bronze beating formidable Australia by 3-2. Semi Pak 1, Australia 0. Better goal average took W. Germany to semifinal after holders India held them for a goalless draw. Though India under Zafar Iqbal coached by Balkrishan Singh scored as many as 15 goals, it was the only top team to concede a goal against every team (total 9) except W. Germany. India finally placed as fifth among 12 (bt US 1-1, bt Malaysia 3-1, bt Spain 4-3, drew W. Germany 0-0, lost to Australia 2-4, bt. N.Z. 1-0, bt. Holland 5-2).

Asian Games Hockey: 1958: 1. Pakistan, 2. India, 3. Korea, 62: 1. Pakistan, 2. India, 3. Malaysia. 66: 1. India, 2. Pakistan, 3. Japan. 70: 1. Pakistan, 2. India, 3. Japan, 74: 1. Pakistan, 2. India, 3. Malaysia. 78: 1. Pakistan, 2. India, 3. Malaysia. 82: Pak bt. India in final 7-1. Bronze for Malaysia who bt. Japan 3-0.

Champions Trophy Hockey: 1978 Pakistan won at Lahore. 80 Pak won at Karachi. 81 Holland won at Karachi. 82 Holland won at Amsterdam. 83 Australia won at Karachi. 84 Dec. Australia retained at Karachi beating World and Olympic champs Pak 2-0 in the x-nation tourney. India didnot participate.

1985 at Perth Australia. Aus won vs. W. Germany 2-1. Placings: 1. Aus. 2. Britain, 3. W. Germany, 4. Pak, 5. Holland, 6. India (bt. Pak 2-1, drew W. Ger 5-5, lost to Aus 1-4, Britain 1-2, Holland 0-3).

Inercontinental Cup Oct. 85 Barcelona, Spain. Hosts won vs. New Zealand 9-7. Third place Poland 4. Canada.

Four Nation Hockey 85 at London: 1. Holland, 2. USSR, 3. England, 4. India (India lost to USSR 0-2, Holland 0-1, England 1-2).

Junion under 21 World Hockey 85 Aug. at Vancouver. W. Germany retained vs. Holland 4-2, 3rd Pak bt. Aus 4-2 5th India.

Asia Cup Hockey 85 at Dhaka Pak won finals vs. India 3-2. Second half extra time controversial goal scored by Kalimullah, Jap. ref. Yashomito Yubuta attacked by Indian players. 6 Indians suspended by Intl. Hockey Federation. Semi: India 9 Jap 1; Pak 7, S. Korea 0, 3rd place, S. Korea 4. Jap 5. Malaysia, 6. Bangladesh, 7. China, 8. Sri Lanka, 9. Singapore, 10. Iran. Naeem of India topped with 12 goals.

Six National Hockey 85 Dec. at Ipoh, Malaysia. After 5 years a Hockey Championship for India Raja Aslan Shah Trophy under Mohamed Shahid bt hosts Malaysia 4-2. 3rd place Pak bt. Spain 2-1 5th place Australia bt. England 8-6. Semi: Malaysia 3 Spain 1; India 1 Pak 0 (Goal by Hardip Singh).

Emirates Hockey Jan. 86 at Dubai: India won on goal average after being tied with W. Germany on points. 3 Pak, 4. Britain.

Rangaswamy Cup National Hockey: 1928: U.P. 30: Railways. 32: Punjab. 34: Not held. 36: Bengal, 38: Bengal. 40: Bombay. 42: Delhi, 44: Bombay, 45: Bhopal 46: Punjab. 47: Punjab. 48: Bhopal. 49-51: Punjab. 52: Bengal. 53: Seviles. 54: Punjab. 55: Services & Madras. 56: Services. 57-59: Railways. 60: Services. 61: Railways. 62: Punjab. 63-64: Railways. 65: Punjab. 66: Railways & Services. 67: Madras & Railways. 68: Railways. 69: Punjab. 70: Punjab & Railways. 71-72: Punjab. 73:

Services. 74-76: Railways. 77: Railways & Indian Airlines. 78: Airlines. 79: Railways. 80-83: Punjab. 84: Airlines.

National Hockey 85 at Palghat Kerala. Services bt. Punjab 10-9 in tie breaker.

Nehru Cup Hockey Delhi Dec. 85: Indian Airlines won vs. Punjab Police 2-1. Bombay Gold Cup 1985 Indian Airlines won vs. Pak International Airlines 4-1.

Calcutta Beighton Cup of 90th year IA bt. EME Centre.

Madurai Coats Centenary 85 Southern Command Bangalore bt. EME Jalandhur 6-2 in tie breaker.

G. Kuppuswamy Trophy 85 S.C. Bangalore bt. EME Jalandhur 2-0.

Murugappa Gold Cup Hockey 85 S.C. Bangalore bt. JCT Phagwara 2-1.

Womens Hockey. World Womens Hockey 83 at Kuala Lumpur 1. Holland. 2. Canada. 3. Australia. 4. W. Germany. 5. England. 6. U.S. 7. N.Z. 8. Scotland. 9. Argentina. 10. USSR. 11. India. 12. Wales.

Women Hockey: Olympics held for first time in 1980 Zimbabwe won. 1984-1. Holland. 2. W. Germany. 3. U.S.A.

38th National Womens Hockey: 85 Jan. Railways retained for fifth year in a row beating Air India in tie breaker 8-7. Semi: Air India 2 Bihar 0; Railways 3, Karnataka 0.

Indira Gandhi Gold Cup Women Hockey held at Delhi 85 Nov. India & USSR shared

152. SQUASH

World Open 85 Nov. Cairo Jahangir Khan 22 yr. old Pak, became first ever player to

win 5 time bt. Ressa Norman New Zealand 3-1.

153. SWIMMING

Olympics 1984 Los Angeles

Winners—Men: 100m freestyle: 1. Rowdy Galness (U.S.) 49.80 Sec. 2. Mark Stockwell (Aus). 3. Per Jhonson (Sweden). 200: 1. Michael Gross (W. Ger) 1 min. 47.44 sec. (WR). 2. Michael Heath (U.S.). 3. Thomas Farnier (W. Ger). 400: 1. George Dicarlo (U.S.) 3:51.23. 2. John Mykkanen 3. Justin Lemberg (Aus.) 1,500: 1. Michael O'Brien (U.S.) 15:05:20 2. George Dicalo (U.S.). 3. Stephan Pfeiffer (W.Ger).

100 m backstroke: 1. Rick Carey (U.S.) 55.79. 2. Davild Wilson (U.S.). 3. Mike West (Can). 200 m: 1. Rick Carey (U.S.) 2:00.23 2. Frederic Delcourt (Fra.). 3. Cameron Henning (Can).

100 m Breast stroke: 1. Steve Lundquist (U.S.) 1:01.65 (WR). 2. Victor Davis (Can). 3. Peter Evans (Aus). 200 m: 1. Victor Davis (Can) 2:13.34 (WR). 2. Glenn Berngen (Aus). 3. Etienne Dagon (Switz).

100 m Butterfly: 1. Michael Gross (W.Ger) 53.08 (WR) 2. Pablo Morales (U.S.). 3. Glenn Buchanan (Aus). 200 m: 1. John Sieben (Aus) 1:57.04 (WR). 2. Michael Gross (W. Germany). 3. Rafael Vidal Castro (Venezuela).

200 m individual medley: 1. Alex Baumann (Can) 2:01.42 (WR). 2. Pablo Morales (U.S.). 3. Neil Cochran (GB). 400 m: 1. Alex Baumann (Can) 4:17.41 (WR). 2. Ricardo Pardo (Brz). 3. Robert Woodhouse (Aus).

4 × 100 m freestyle relay: 1. US (Chris Cavanaugh, Mike Health, Matt Blondi and Rowdy Ganes) 3:19.03 (WR). 2. Aus (Gregory Fasala, Neil Brooks, Michael Delamy and Mark Stockwell). 3. Sweden (Thomas Edstrom, Bengt Baron, Mikael Orm and Per Johnson). 4 × 200 m: 1. US (Mike Heath, David Larson, Jeff Float and Bruce Hayes) 7:15.69 (WR). 2. Germany (Thomas Fahrner, Dirk Korthals, Alexander Schowtka and Michael Gross). 3. Britain (Neil Cochran, Paul Easter, Paul Howe and Andrew Astbury).

4 × 100 m medley relay: 1. U.S. (Rick Carey, Steve Lundquist, Pablo Morales and Rowdy Ganes) 3:39.30 (WR). 2. Canada (Mike West, Victor Davis, Tom Pointing and Sandy Goss). 3. Australia (Mark Kerry, Pete, Eavane, Glenn Buchanan and Mark Stockwell).

Women: 100 m freestyle: 1. Nancy Hoghead (US) and Carrie Steinseifer (U.S.) 55.9

ad-heat) both awarded gold medals. No
ver, 3. Annemarie Verstappen (Nether-
nds). 200 m: 1. Mary Wayte (U.S.) 1:59.23,
ynthia Woodhead (US), 3. Annemarie Ver-
appen (Netherlands). 400: 1. Tiffany Cohen
S) 4:07.10, 2. Sarah Hardcastle (GB), 3. June
oft (G.B.). 800 m: 1. Tiffany Cohen (US),
4.95, 2. Michele Richardson (US), 3. Sarah
ardcastle (GB).

100 m breaststroke: 1. Petra Van Staveren
(Netherlands) 1:09.88, 2. Anne Ottenbrite
(Netherlands) 1:09.88, 2. Anne Ottenbrite
(Canada), 3. Catherine Poirot (France). 200
1. Anne Ottenbrite (Canada) 2:30.38.2.
usan Rapp (US), 3. Ingrid Zempereur (Bel-
um).

100 m backstroke: 1. Teresa Andrews (US)
02.55, 2. Betsy Mitchell (US), 3. Lolanda de
over (Netherlands). 200 m: 1. Lolanda de
over (Netherlands) 2:12.38, 2. Amy White
S), 3. Aneta Partrascolu (Rom).

100 m butterfly: 1. Mary T. Meagher (US)
.26, 2. Jenna Johnson (US), 3. Kerinne Seich
V.Ger). 200 m: 1. Mary T. Meagher (US)
06.90, 2. Karen Phillips (Aus), 3. Ina Beyer-
ann (W.Ger).

200 m Individual Medley: 1. Tracy Caul-
kins (US) 2:12.64, 2. Nancy Hogshead (US), 3.
michele Pearson (Aus). 400 m: 1. Tracy
aulkins (US) 4:39.24, 2. Suzanne Landells
(us), 3. Petra Zindler (W.Ger).

4 × 100 m Freestyle Relay: 1. US (Jenna
nson, Carrie Steinseifer, Dara Torres and
ancy Hogshead) 3:43.43, 2. The Netherlands
nnemarie Verstappen, Elles Vosles, Pesi
ijers and Connie Van Bentum), 3. West
er. (Iris Zscherpe, Suzanne Schuster,
ristian Pielke and Karine Seich).

4 × 100 m Medley Relay: 1. US (Teresa
drews, Tracy Caulkins, Mary T. Meagher
d Nancy Hogshead) 4:08.34, 2. West Ger.
renja Schlicht, Ute Hasse, Ina Beyermann
d Kerinne Seich), 3. Canada (Remma
do, Anne Ottenbrite, Michele McPherson
d Pamela Rae).

Madals Table: U.S. 21—13—0—34, Canada
—3—10—17 W. Germany 2—3—6—11, The
etherlands 2—1—3—6, Australia 1—5—6—
Britain 0—1—4—5, France 0—1—1—2,
razil 0—1—0—1, Sweden 0—0—2—2, Bel-
um 0—0—1—1, Romania 0—0—1—1, Swit-
land 0—0—1—1, Venezuela 0—0—1—1.
vo golds awarded to U.S. in the women's

Olympic Records

Most Olympic Titles: Men—The most Olym-
pic gold medals won is ten (an absolute
Olympic record) by Ray C. Ewry (US)
(1874–1938) in the Standing High, Long
and Triple Jumps in 1900, 1904, 1906 and
1908.

Most Olympic Titles Women: The most
gold medals won by a woman is four
shared by Francina "Fanny" E. Blanders-
Koen (Netherlands) (b. April 26, 1918)
with 100 m, 200 m, 800 m hurdles and 4 ×
100 m relay, 1948, Betty Cuthbert (Aus-
tralia) (b. April 20, 1938) with 100 m,
200 m, 4 × 100 m relay, 1956 and 400 m,
1964, and Barbel Wöckel (nee Eckert) (b.
Mar. 21, 1955) (E.Ger) with 200 m and 4
× 100 m relay in 1976 and 1980.

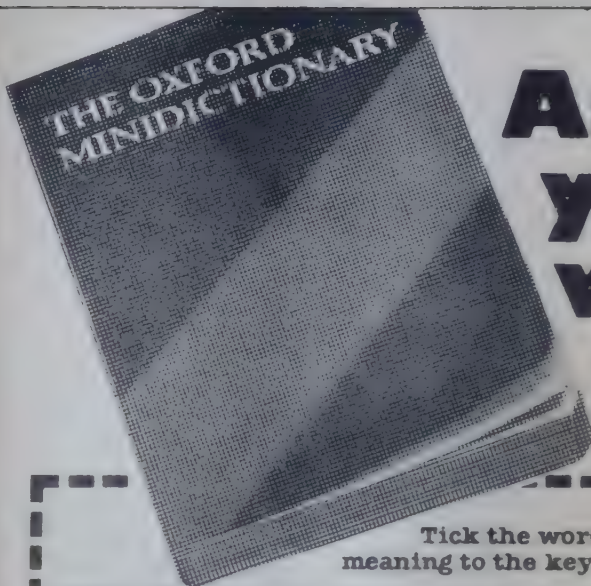
Most Wins At One Games: The most
gold medals at one celebration is five by
Paavo Johannes Nurmi (Finland) (1897–
1973) in 1924, (1876–1928) in 1900, with
60 m, 110 m hurdles, 200 m hurdles and
long jump.

Most Olympic Medals Men: The most
medals won is 12 (nine gold and three
silver) by Paavo Nurmi (Finland) in the
Games of 1920, 1924 and 1928.

Most Olympic Medals: The most medals
won by a woman athlete is seven by
Shirley de la Hunty (nee Strickland, Aus-
tralia) (b. July 18, 1925) with three gold,
one silver and three bronze in the 1948,
1952 and 1956 Games.

Most Records in a Day: Jesse Owens
(1913–80) (USA) set six world records in
45 min at Ann Arbor, Michigan on 25
May 1935 with a 9.4 Sec 100 yd at 3.15
p.m., a 26ft 8 1/4 in 8, 13 m long jump at
3.25 p.m., a 20.3 sec 220 yd (and 200 m) at
3.45 p.m. and a 22.6 sec 220 yd low
hurdles (and 200 m) at 4.00 p.m.

Most Interantional Appearances: The
greatest number of international matches
contested for any nation is 89 by Bjrn
Bang Andersen (b. 14 Nov. 1937) for
Norway, 1960–81.



Assess your word power!

Tick the word or phrase you believe is nearest in meaning to the key word :

DISDAIN	(a) Contempt	(b) Pride	(c) Daring	(d) Humility
DRIBBLE	(a) Labour	(b) Force	(c) Lash	(d) Slow trickle
INTENSE	(a) Emotional	(b) Very strong	(c) Eager	(d) Active
HITCH	(a) Risk	(b) Hesitation	(c) Ill-luck	(d) Difficulty
SYNTHETIC	(a) Hard	(b) Smooth	(c) Artificially made	(d) Dyed
VIVID	(a) Pure	(b) Weak	(c) Lively	(d) Strong
EBB	(a) Withdrawal	(b) Decline	(c) Collapse	(d) Residue
SCARCE	(a) Rare	(b) Peaceful	(c) Scary	(d) Pure
WHIFF	(a) Fresh Air	(b) Smell	(c) Pleasant smell	(d) Bad smell

How much did you score?

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00 m freestyle after a dead heat. No Silver).

Asiad 1982 New Delhi: Men: 100 m freestyle: 1. Ban Leong Young, Singapore 53 sec. 2. Quiyang Wan, China, 3. Lukeman Joyode, Indonesia. 200: 1. William Witson, Philippines 1:57.41, 2. Jean. Huang Vu, China, 3. Guvvah Wang, China 400: 1. Ikuhiro Terashita, Jap 4:08.71, 2. William Witson, Philippines, 3. Jean Huang Vu, China. 1500: 1. Ikuhiro Ausai, Jap 16:21.32, 2. Keysuke Okuno, Jap. 3. William Witson Philippines.

100 m Backstroke: 1. Kenji Ikeda, Jap 59.91, 2. Headethosi Thakahashi Jap. 3. Lukeman Joyode, Indonesia. 200: 1. H. Thakahashi, Jap 1:08.33, 2. Cintian Yang, China. 3. Lukeman Joyode, Indonesia.

100 m breast stroke: 1. Rucheng Yi, China 1:05.93, 2. Shingehiro Thakhashi, Jap, 3. Fu n, China, 200: 1. Narithoshi Matsude, Jap 2:25.90, 2. Hu Jin, China, 3. S. Thakahashi.

100 m butterfly: 1. Taihi Saka, Jap, 57.27, 2. Chao Chen, China, 3. Peng Ziao Peng, Singapore. 200: Taihi Saka, Jap 2:04.91, 2. Jung Young Bang, Korea, 3. Sokosu Hirata.

200 m Ind. Medley: 1. Shong Yili China, 1:10.93, 2. Keichi Hata, Jap. 3. Shinji Ito, Jap. 400: 1. Keichi Hata, Jap, 4:39.86, 2. Jiyas Hang n, China, 3. Shinji Ito, Jap.

400 m Medley relay: 1. Jap 3:56.46, 2. China, 3. Indonesia.

4 x 100 m freestyle: 1. China 3:33.74, 2. Jap, 3. Indonesia.

4 x 200 m: 1. Jap 7:49.76, 2. China, 3. Indonesia.

Water Polo: 1. China, 2. Jap, 3. India.

Women: 100 m Freestyle: 1. Kavori Yanase p 57.88, Chicaco Nakamore, Jap, 3. Sha Li, China. 200: 1. K. Yanase, Jap 2:06.12, 2. Mika Aito, Jap, 2. Mia Deli, China. 400: 1. M. Saito 2:24.72, 2. Junco Sakurai. 800: 1. Navomi Kido, Jap 9:03.50, 2. Janko Sakurai, Jap, 3. Yu Li, Korea.

100 m backstroke: Yun Hichoi, Korea 1:06.39, 2. Yun Jung Choi, Korea, 3. Koto, ayeda. 200: 1. Yun Hichoi, Korea 2:21.96, 2. in Jung Choi, Korea, 3. Hise Hsari, Jap.

100 m breast stroke: 1. Hiroko Nagasaki,

Jap 1:12.73, 2. Myong Suk Kim, P. R. Korea, 3. Hong Shao, China. 200: 1. H. Nagasaki, Jap 2:33.78, 2. M. S. Kim PR Korea, 3. Beyben Liang, China.

100 m Butterfly: 1. Takeni Ise, Jap 1:02.22, 2. Kiyemitaka Hashi, Jap, 3. Fan Lin, China. 200: 1. K. Hashi, Jap 2:16.63, 2. T. Ise, Jap, 3. Kum Hihim, Korea.

200 m Ind. Medley: 1. Yunhi Chi, Korea 2:24.32, 2. Hideka Koshimisu, Jap, 3. Yung Jung Choi, Korea. 400: 1. H. Koshimisu, Jap, 5:02.79, 2. Natami Sikedo, Jap, 3. Siyun Li, Korea. 4 x 100 Medley: 1. Jap 4:21.32, 2. China, 3. Korea. 4 x 100 freestyle: 1. Jap 3:59.27, 2. China, 3. Singapore.

National Acquatics at Bombay 85 Jan: Six states- Tamil Nadu, Andhra Pradesh, Punjab, Bihar, Utter Pradesh, Delhi and All India Police withdrew. Railways won 11 out of 15 titles. Wilson Cherian won 4 golds, bettering his national mark in 200 m backstroke. In the womens section Anita Sood (Mah) broke 4 records and compatriot Persis Madan. Men: 1. Railways 149 Points, 2. Maharashtra 83, 3. Services 75. Women: 1. Mah 148, 2. W. Bengal 86, 3. Karnataka 85. Individual Champs Men: Wilson Cherian, Railways. Women: Persis Madan, Maharashtra. Water Polo: 1. Services, 2. Maharashtra 3. Railways.

Asian Age Group Swimming Bombay 1985 Sept. Medals table. India 22-45-49 Japan 21-11-3 Indonesia 17-12-7 Kuwait 10-11-6 Hong Kong 10-5-4 Malaysia 7-3-5 Korea 4-4-2, Srilanka 0-0-10, Bahrain 0-0-3, Bangladesh 0-0-2, Nepal 0-0-0. Individual Gold tally. Girls: Edith Budiman, Indonesia and Sonal Nanavati, India five each. Boys: Alhar Saeed, Kuwait and Jason Khoo, Malaysia four each.

Inter Varsity Swimming at Amaravathy 85 Nov. 18 recotds broken. Team championship Men: 1. Delhi, 2. Gandhiji, 3. Kerala Individual: 1. Balraj Rathi, Delhi, 2. T.M. Aji, Gandhiji, 3. Nandkumar Gandhiji. Women: 1. Bombay, 2. Kerala 3. Poona. Ind. 1. Anita Sood, Bombay, 2. Kavita Sood, Bombay, 3. G Vijaya Kumari, Kerala.

154. TABLE TENNIS

World Cup Beijing Aug 85 Chen Xinhua, China captured 6th World Cup vs Andrzej

Grubba Poland 21-16, 21-15, 21-11. Current Champ Jiang Jialing, China finished third vs

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Chen Longean China 21-16, 22-20.

U.S. Open: Cheng Yinghua China bt. holder Wen Chia, Taiwan. 3-6 at Miami Beech June 85. Women: Li Huiheng, China bt. Cao Yanhua, China 3-0.

Asia Cup: Chen Longean, China bt. world champ Jiang Jialing, China 3-1 at Singapore Sept 85. Women: Jiau Zhimin, China bt. Ni Xia Lian, China 3-0.

Asian Games T.T. Men: 1. China, 2. Jap. 3. Korea. Women: 1. China, 2. Korea, 3. DPR Korea. Singles Men: 1. Saiki Si, China, 2. Kiyosli Sayato, Jap. 3. Seji Ono, Jap. Women: 1. Yanliwa Kao, China, 2. Ling Tong, China, 3. Kiyung Miyun Yun, Korea. Doubles: 1. Seji Ono and Hiroyuki Abe, Jap, 2. Van Kin and Kidyak Kim, Korea, 3. Jean Hui and Sinhua

Chen, China Women: 1. Yan Hua Kao and Lily Dayi, China, 2. Ling Tong and Twin Juanboo, China, 3. Young Sukli and Jong Havalin DPR Korea. Mixed doubles: 1. Saiki Si and Yan Hua Kao, China, 2. Sinhua Chen and Ling Tong, China, 3. Kil Jung Yan and Kim Yung Miyun, Korea.

Asian Cup Prize Money T.T. at Delhi 1985 Jan. Men: Hui Jun, China bt. Cai Zhen Huna, China 3-1. Women: Ling Tong, China by Ni Xialian, China 3-1.

National Games T.T. 85 Nov. Delhi Team Men 1. Delhi, 2. Mah. Women: 1. Maharashtra, 2. Karnataka. Singles: Men: Kamallesh Mehta, Mah bt. S. Sriram, Mah 21-15, 21-19, 21-18. Women: Vyoma Parikh, Mah bt. Monalisa Barua, Assam 21-19, 21-19, 19-21, 21-17.

155. TENNIS

Davis Cup finals Dec. 85. Munich. Sweden retained vs. W. Germany 3-2. Mats Wilander bt. Michael Westphal 6-3 6-4, 10-8. Stefan Edberg lost to Boris Becker 3-6, 3-6 M. Wilander and Joatim Nyvstroam bt. B. Backer and Andrews Maurer 6-4, 6-2, 6-1. M. Wilander lost to B. Becker 3-6, 6-2, 3-6, 3-6. Stefan Edberg bt. Michael Westphal 3-6 7-5, 6-4, 6-3.

Federation Cup Womens Tennis: 85 Oct. Nagoya, Jap: Czechs retained vs. U.S: 2-1 for 4th year. Consolation victory for 11 times winner U.S. in doubles. Elsie Burgin and Kathy Jordan bt. Regina Marsikova and Andree Holikova 6-2, 6-3.

Wimbledon 1985 Singles Men: Boris Becker, W. Germany bt. Kevin Curren, U.S. 6-3, 6-7, 7-6, 6-4 became youngest ever to won at 17. Martina Navratilova, U.S. bt. Chris Lloyd, U.S. 4-6, 6-3, 6-2. Doubles: Men: Heinz Gunthardt, Switz and Balazs Taroczy, Hungary bt Pat Cash and John Fitzgerald, Australia 6-4, 6-3, 4-6, 6-3. Women: Kathy Jordan and Elizabeth Sayersmylie, Aus. bt. M. Navaratilova and Pam Shriver, U.S. 5-7, 6-3, 6-4. Mixed: M. Navratilova, U.S. and Paul Mc Namee, Aus bt. Elizabeth Sayers Smylie and J. Fitzgerald, Aus. 7-5, 4-6, 6-2.

[See Special Feature on Boris Becker]

Wimbledon Winners

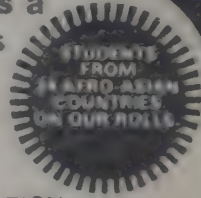
Year Men	Women		
1877 S.W. Gore	-	1889 " "	Mrs. C.W. Hillyard
1878 P.F. Hadon	-	1890 W.J. Hamilton	Miss L. Rice
1879 J.T. Haydley	-	1891 W. Baddeley	Miss L. Dod
1880 J.T. Hartley	-	1892 " "	" "
1881 W. Renshaw	-	1893 J. Pim	" "
1882 " "	-	1894 " "	Mrs. C.W. Hillyard
1883 " "	-	1895 W. Baddeley	Miss C. Cooper
1884 " "	Miss Maud Watson	1896 H.S. Mahany	" "
1885 " "	" "	1897 R.F. Doherty	Mrs. C.W. Hillyard
1886 " "	Miss Bingley	1898 " "	Miss C. Cooper
1887 H.F. Lawford	Miss L. Dod	1899 " "	Mrs. C.W. Hillyard
1888 W. Renshaw	" "	1900 " "	" "
		1901 " "	Mrs. A. Sterry
		1902 A.W. Gore	Miss M.E. Robb

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1903 H.L. Doherty	Miss D.K. Douglas	1950 B. Patty	" "
1904 " "	" "	1951 R. Savitt	D. Hart
1905 " "	Miss M. Sutton	1952 F.A. Sedgeman	Miss M. Connolly
1906 " "	Miss D.K. Douglas	1953 V. Selas	" "
1907 N.E. Brookes	Miss M. Sutton	1954 J. Drobny	" "
1908 A.W. Gore	Mrs. A. Sterry	1955 A. Traber	L. Brough
1909 " "	Miss D.P. Boothby	1956 L.A. Hoad	S. Fry
1910 A.W. Wilding	Mrs. Lambert Chambers	1957 " "	Miss A. Gibson
1911 A.F. Wilding	" "	1958 A.J. Cooper	" "
1912 " "	Mrs. Dr. Lordcome	1959 A. Olmedo	M.E. Bueno
1913 A.F. Wilding	Mrs. Lambert Chambers	1960 N.A. Fraser	" "
1914 N.E. Brookes	" "	1961 Rod Laver	A. Mortimer
1919 G.L. Patterson	Miss S. Lenglen	1962 " "	J.R. Susman
1920 W.T. Tilden	" "	1963 C.R. McKinley	Margaret Smith
1921 " "	" "	1964 S. Emerson	M.E. Bueno
1922 G.L. Patterson	" "	1965 " "	Miss Margaret Smith
1923 W.M. Johnston	" "	1966 Manuel Santana	Mrs. Billie Jean King
1924 J. Borotra	Miss K. Metane	1967 John Newcombe	" "
1925 R. Lacoste	Miss S. Lenglen	1968 Rod Laver	" "
1926 J. Borotra	Miss L.A. Godfree	1969 " "	Ann Jones
1927 H. Cochet	Miss H. Wills	1970 John Newcombe	Mrs. Margaret Court
1928 R. Lacoste	" "	1971 " "	Miss Evonne Goolagong
1929 H. Cochet	" "	1972 Stan Smith	Mrs. Billie Jean King
1930 W.T. Tilden	Mrs. F.S. Moody	1973 Jan Kodes	" "
1931 S.B. Wood	Frankein C. Aussem	1974 Jimmy Connors	Chris Evert
1932 H.E. Vines	Mrs. F.S. Moody	1975 Arthur Ashe	Billie Jean King
1933 J.H. Crawford	" "	1976 Bjorn Borg	Chris Evert
1934 F.J. Perry	Miss D.E. Rand	1977 " "	V. Wade
1935 " "	Mrs. F.S. Moody	1978 " "	M. Navratilova
1936 " "	Miss H.H. Jacobs	1979 " "	" "
1937 J.D. Budge	Miss D.E. Rand	1980 " "	Evonne Cawley
1938 " "	Mrs. F.S. Moody	1981 John McEnroe	Chris Evert
1939 R.L. Riggs	Miss A. Marble	1982 J. Connors	M. Navratilova
1946 Y. Petra	Miss P. Betz	1983 John McEnroe	" "
1947 J. Kramer	Miss M. Osborne	1984 J. McEnroe	" "
1948 R. Falkenburg	Miss L. Brough	1985 Boris Becker	" "
1949 F.R. Schoeder	" "		

U.S. Open: 85 Men: Ivan Lendl bt. J. McEnroe 7-6, 6-3, 6-4 Ken Flach and Robert Seguro, U.S. bt. Yannick Noah and Henri Leconte, France 6-7, 7-6, 7-6, 6-0. Women: Hana Mandlikova bt. M. Navratilova 7-6, 1-6, 7-6. Claudia Kohde and Kilscht Helena Sukova Czech bt. M. Navratilova and P. Fierver 6-7, 6-2, 6-3 Mixed Doubles M. Navratilova and Heinz Gunthardh bt. Elizabeth Smytie and John Fitzgerald 6-3, 6-4.

Australia Open Dec. 85 Women: Martina Navratilova won third Australian title vs. archrival Chris Evert Lloyd 6-2, 4-6, 6-2 in 194 mts and claimed one lakh dollars. Men: Young Swedish Stefan Edberg knocked out

topseed Ivan Lendl to claim 1.5 lakh dollars in all Swedish mens final. 6-7, 7-5, 6-1, 4-6, 9-7 in 4 hours

French Open: Singles men: Mats Wilander. Sweden bt. Ivan Lendl, Czech 3-6, 6-4, 6-2, 6-2. Women: Chris Evert Lloyd, U.S. bt. Martina Navratilova U.S. 6-3, 6-7, 7-5. Doubles Martina Navratilova and Pam Shriver, U.S. bt. Claudia Kohde-Kilsch W. Germany and Helene Sukova, Czech 4-6, 6-2, 6-2. Mixed. M. Navratilova and Beinz Gunthardh, Switz bt. Francisco Gonzales, Paraguay and Paula Smith, U.S. 2-6, 6-3, 6-2.

U.S. National Indoor: Stefan Edberg, Sweden bt. Yannick Noah, France 6-1, 6-0.

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- Indoor Airblast Circuit Breakers
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Association of Tennis Professional ATP Championship Mason: Boris Becker, W. Germany bt. Mats Wilander, Sweden 6-4, 6-2.

Ambresolaire World Team Cup: U.S. bt. Czech 2-1. McEnroe lost to Ivan Lendl 4-7, 6-7, 3-6. J. Connors bt. Miloshav Meir 6-3, 3-6, 7-5. Ken Flach and Robert Seguro bt. I. Lendl and Thomas Smid 6-3, 7-6.

Grand Prix Women Tennis: Fidelstadt W. Germany 85 Oct. Pam Shriver, U.S. bt. Cetrin Lindquish, Sweden 6-1, 7-5 to win 1.75 lakhs

dollar. Doubles: P. Sriver and Hana Mandlikove, Czech bt Carina Karlsson, Sweden and Tine Schenck-larsen, Denmark 6-2, 6-1.

National Tennis at Bangalore 85 Men: Nandan Bal bt. Narendra Nath of A.P. 6-4, 6-4. *Women:* Radhika Krishnan of T.N. bt. Bela Pandit, Mah 4-6, 6-4, 6-4. Doubles: Radhika and Bela Pandit bt. Nandan and Enrico Piperno. Vet. Singles: Akhtar Ali, Jr. National Champ, Zceshan Ali, 16 year s/o. former Davis Cupper Akhtar Ali, won the under 16 and under 18 singles and doubles.

156. VOLLEYBALL

Olympics:

1964 Russia (Women Jap), 68: Russia (Russia), 72: Japan (Russia), 76: Poland (Jap), 80 Russia (Russia), 84 at Los Angeles: USA bt. Brazil 15-6, 15-6, 15-7. Women: China who went down to US 1-3 in prelim, bt them in finals 16-14, 15-3, 15-9.

World Super Women's Volley: 1984 Nov. at Hong Kong: China won.

Asian Games:

1954: 1. India, 2. Japan. 58: 1. Japan, 2. Iran, 3. India. 62: 1. Japan, 2. India, 3. Pakistan. 66: 1. Japan, 2. Korea, 3. Taiwan. 70: 1. Japan, 2. S. Korea, 3. Taiwan. 74: 1. Japan, 2. S. Korea, 3. China. 78: S. Korea, 2. Japan, 3. China. 82: 1. Japan, 2. China, 3. Korea.

Women: 66: 1. Japan, 2. Korea, 3. Iran. 70: 1. Japan, 2. South Korea, 3. Cambodia. 74: 1. Japan, 2. Korea, 3. China. 78: 1. Japan, 2. China, 3. S. Korea. 82: 1. China, 2. Japan, 3. Korea.

Asian Junior Womens Volley 84 Sept. at Canberra: Jap won vs. China 15-6, 15-8, 15-9.

Nationals:

1952: Mysore, 53: Delhi, 54: Punjab, 55: Punjab, (Women-U.P.), 56: Punjab (U.P.), 57: Services (Punjab), 58: Delhi (Punjab), 59: Railways (Punjab), 60: Services (Punjab), 61: Railways (Punjab), 62: Punjab (Punjab), 63: Punjab (Madras), 64: Railways (Madras), 65: Hyderabad (Punjab), 66: Services (Andhra), 67: Services (Andhra), 68: Punjab (Punjab),

69: Punjab (Andhra), 70: Punjab (Punjab), 71: Punjab (Not held), 72 & 73: Punjab (Kerala), 74: Karnataka (Bengal), 75: U.P. (Kerala), 76: Tamil Nadu (Kerala), 77: Services (Bengal), 78: Punjab (Railways), 79: Punjab (Bengal), 80: Railways (Kerala), 81: Punjab (Railways), 82: Haryana (Kerala), 83: Railways (Kerala), 84: Railways (Railways).

National Volley 85 Dec. Delhi - Women: Kerala bt. T.N. 15-5, 15-6, 10-15, 14-16, 15-11. Rlys won third place vs. Punjab 3-1. Men: Rlys won for third time in a row vs. Haryana 18-16, 15-13, 15-8 - Kerala finished third vs. T.N. 3-2.

National Games Volley 85 Nov. Delhi - Men: 1. Kerala, 2. Haryana, 3. Rajasthan. Women: 1. Kerala, 2. T.N., 3. Delhi.

Inter Varsity Men: 1. Calicut, 2. Kerala. *Women:* Volleyball at Tenhippalam 85 Dec. 1. Gandhiji, 2. Calicut, 3. Gurunanak, 4. Calcutta.

Federation Cup Volley 1982 Kottayam Federation Presidents team won finals vs. Kerala. 83 Salem: Rlys won men and women beating T.N. 3-0 and P & T 3-0 respectively. 1984 Calicut: Rly women bt. Kerala 3-2 and Rly men bt. T.N. 3-2. 1985 Tirunelveli: Rly. women bt. Kerala 3-15, 6-15, 15-11, 15-11, 15-8. Combined varsities men bt. Haryana.

Junior National Volley 1985 Oct. Chandigarh: A.P. boys bt. Karnataka 9-15, 15-3, 15-12, 15-8 to win 5th time in row. T.N. girls won vs. Mah. 15-4, 15-9, 15-7.

157. WEIGHT LIFTING

World Championship:

Moscow Dec. 1983. Nineteen world re-

cords set, and went down as the greatest in the history of the Iron Sport. Anatoli

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**Right now,
this man is busy saving 10,000
desperate flood victims.**



Pisarenko of USSR emerged as the strongest man on Planet Earth.

Fly weight 52 Kg: 1. Terziski, Bulgaria 260, 2. Jacek Gutowski, Poland, 3. Stefan Lelatto. Terziski's Jerk of 150 Kgs is a new world record. Bantam 56 Kg: 1. Oksin Mirzoyan, USSR 292.5, 2. Sulemainov, Bulgaria, 3. Andreez Letz, GDR. Sulemainov set world record in snatch of 130 Kg. Letz also world record in total of 292.5. Feather 60 Kg: 1. Yuri, USSR 312.5, 2. Topurov, Bulgaria, 3. Radu Gelu, Romania. Sarkisyan set world record in total of 312.5. Light Weight 67.5l: 1. Joachin Kunz, GDR 340, 2. Yanko Rusev, Bulgaria, 3. Andrees Behm, GDR. Middle Weight 75 Kg: 1. Varbonov, Bulgaria 370, 2. Kuznetsov, USSR, 3. Stoichkov, Bulgaria. Light Heavy 82.5: 1. Uri Vardanian, USSR 392.5, 2. Asen Zlatev, Bulgaria, 3. Barsi Hungary. Vardanians 180.5 in snatch world record. Middle Heavy 90 Kg: 1. Blagoi Blagoev, Bulgaria 417.5, 2. Solodov, USSR, 3. Piotrowski, Poland. 230 Kg Jerk by Solodov is world record. Heavy 100 Kg: 1. Kazneitsov, USSR 422.5, 2. Popov USSR, 3. Komar, Poland. Super Heavy 110 Kg: 1. Vicheslev Klovov, USSR 440, 2. Jasco, Hungary, 3. Anton Baraniak, Czech. Klovov set world records in Jerk 247.5 and total 440. Over 110 Kg: 1. Anatoli Pisarenko, USSR 450, 2. Alexander Kurlovich, USSR, 3. Antonio Krastev, Bulgaria.

Olympics 1984:

Fly weight: 1. Zeng Guoquiang, China 235.0 Kg, 2. Zhou Peishum, China, 3. Kazhushito, Manabe, Jpn. Bantam: 1. Wu Shude, China, 267.5, 2. Lai Runming, China, 3. Masahiri Kotake, Japan. Feather: 1. Chen Wei-quang, China 282.50, 2. Gelu Rade, Rom, 3. Wenye Tsai Tpe. Light weight: 1. Yao Jingyuan, Chn, 320, 2. Andrei Socaci, Rom, 3. Jouni Gronman Fin. Middle: 1. Karl Heinz Radshinsky, FRG 340, 2. Jaques Demers, Can. 3. Dragomir Gioroslan, Rom. Light heavy: 1. Petre Becheru, Rom, 355, 2. Rober

Kabbas, Aus. 3. Ryoji Isaoka, Jpn. Middle Heavy: 1. Nicu Vlad, Rom, 392.5, 2. Dimitru Petre, Rom. 3. David Mercer, GBR. Heavy: 1. Rolf Milser, FRG 385, 2. Vasile Gropa, Rom. 3. Pekka Neimi, Fin. Super heavy: 1. Norberto Oberburger, Ita. 390 2. Stefan Tasnadi, Rom. 3. Guy Carlton, USA. Over 110 Kg: 1. Dinko Lumkin, Aus. 412.5, 2. Mario Martinetz, USA, 3. Manfred Nerlinger, FRG.

Asian Games Weight Lifting Champions: Fly: Kasu Fitoman Abli, Jpn 235. Bantam: Vu Shde, China 265.5, Feather: Chenvi Kwiyang, China 282.5. Light: Yao Jingian, China 307.5. Middle: Pakize Jan Ali, Iran 340.0 Light Heavy: Isaoka Rayoji, Jap. Middle heavy: Maren Guang, China 337.5. Heavy: Yengi Yung, Korea 327.5. Super Heavy: Yenbio Jack, Korea 350.

37th National Calcutta: National records shattered 21 times. Services 419 points and 26 medals (a gold, 8 silver, 9 bronze) won Burdwan Challenge Trophy for 8th time. 2. Rlys 393 points and 25 medals (16-8-1). 3. T.N. 356 points and 9 medals (1-3-5)

Lifter of the year: Jagmohan, Rlys Results: 52 Kg. 1. Mahendran, Services 2. M.V. Manikyalu Andhra 3. G. Muthuswamy, Ser. 56 Kg: 1. Parvesh Chander, Rly. 2. D. Akhilan, TN 3. Anil Pate Mah. 60 Kg: G. Devan, Rly. 2. Tamilselvan, T.N. 3. S. Devan, T.N. 67 Kg: 1. Jagmohan Sapra, Rly. 2. Mukilva nan, Rly. 3. Thangamani, Rly. 75 Kg: 1. Harnek Singh, Rly. 2. G.B. Khattrack, Mah, 3. K.D. Mondal Bengal, 82.5 Kg: Daler Singh, Ser. 2. Hardeep Singh, Rly. 3. Rajendar Pal, Ser. 90 Kg: 1. Meherchand, Ser. 2. Tarlok Singh, Ser. 3. V.M. Mangaoker, Mah. 100 Kg: 1. Tara Singh, Rly. 2. Vispi Daroga, Mah 3. Major Singh, M.P. 110 Kg: 1. Naville Daroga, Rly. 2. S. K. Khola, Rly 3. Keval Singh, Ser. Over 110 Kg: Balwinder Singh, Rly. 2. Rajinder Singh, Delhi 3. V.B. Rane, Central Secretariat.

158. WRESTLING

Olympics 1984:

Freestyle: 48 Kg: 1. Robert Weaver (USA) 2. Takashaka Irie (Jpn) 3. Gab-do Son (Kor). 52 Kg: 1. Saban Trestena (Yug); 2. Kim Jong Kyu (Kor) 3. Yuji Takada (Jpn). 57 Kg: 1.

Hideaki Tomiyama (Jpn) 2. Barry Davis (USA) 3. Kim Eui-Kon (Kor). 62 Kg: 1. Randy Lewis (USA) 2. Kosei Akaishi (Jpn), 3. Lee Jung-Keun (Kor). 68 Kg: 1. You in-Tak (Kor) 2. Andrew Rein (USA), 3. Jukka Rauhala (Fin).

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4 Kg: 1. David Schultz (USA), 2. Martin Knosp (FRG) 3. Saban Sejdi (Yug) 82 Kg: 1. Mark Schultz (USA), 2. Hideyuki Nagashima (Jpn) 3. Chris Rinke (Can). 90 Kg: 1. Ed Banach (USA) 2. Akira Ohta (Jpn) 3. Noel Joban (GBR) 100 Kg: 1. Leo Banach (USA), 2. Joseph Atiyeh (Syr) 3. Vasile Puscasu (Rom). 100 and above: 1. Bruce Baumgartner (USA) 2. Bob Mille (Can) 3. Ayhan Taskin (Tur).

Greco Roman: 48 Kg: 1. Vincenzo Maenza (Ita) 2. Markus Scherer (FRG) 3. Ikuzo Saito (Jpn). 52 Kg: 1. Atsuji Miyahara (Jpn) 2. Daniel Aceves (Mex) 3. Bang Dae-Du (Kor). 57 Kg: 1. Pasquale Passarelli (FRG) 2. Masaki Eto

(Jpn) 3. Haralambos Holidis (Gre). 62 Kg: 1. Kim Weon-Kee (Kor), 2. Kentolle Johansson (Swe) 3. Hugo Dietsche (Switz). 68 Kg: 1. Vlado Lisiak (Yug) 2. Tapio Sipila (Fin) 3. James Martinez (USA). 75 kg: 1. Jouko Salomaki (Fin) 2. Roger Tallroth (Swe) 3. Stefan Rusu (Rom) 82 Kg: 1. Ion Draica (Rom) 2. Dimitrios Thanopoulous (Gre) 3. Soren Claeson (Swe). 90 Kg: 1. Steven Fraser (USA), 2. Ilie Matei (Rom) 3. Frank Andersson (Swe). 100 Kg: 1. Vaseile Andrei (Rom) 2. Greg Gibson (USA) 3. Josef Terteljje (Yug). Above 100 Kg: 1. Jeffrey Blantnick (USA) 2. Refic Memisevic (Yug) 3. Victor Dolipschi (Rom).



10th ASIAN GAMES SEOUL 1986

Seoul, the South Korean capital city is gearing up to greet two great Sports Events — Asiad and Olympics.

The tenth Asian Games will take its turn first, from 20th September to 5th October, 1986. Two years later Seoul will be proudly hosting 24th Olympiad.

Tenth Asian Games will rather be a dress rehearsal for the prestigious, Summer Olympic Games. Asiad will find its venue in the newly laid Olympic Park. This is a 29,09,000 square meter vast expanse. It encompasses sports facilities, the Olympic Village, a Press Center Indoor Swimming pool, the Gymnasiums, Fencing and Weight Lifting arenas and 18 hard courts for tennis. Facilities for other sports events are also provided. The huge Olympic Stadium which was completed in 1984 will be the main venue for both Asiad and Olympics. This architectural marvel

will provide one lakh spectators a chance to see the opening and closing ceremonies, track and field events and football matches of both these big events.

The 16 day Asiad is expected to draw 5,800 athletes and officials from 36 member nations of the Olympic Council of Asia to Seoul. In addition to this, 2000 officials from international sports federations, 2300 journalists and 1,50,000 tourists are also expected.

For India, Tenth Asiad will be another opportunity to prove its mettle as an Asian sports power. China, Japan and the hosts South Korea are expected to dominate games. India's best hopes lie in her ace sprinter P.T. Usha, middle distance runner, Shiny Abraham and Hockey teams of men and women. Our Pugilists, Wrestlers and other track stars also arouse medal winning hopes.

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SPECIAL FEATURE

BORIS BECKER: TENNIS PRODIGY

Thunder and lightning. Enter Boris Becker. The West German Tennis Prodigy's invasion of the Wimbledon show courts was as dramatic as that. At 17, this blond six footer from Liemen, West Germany, became a legend, the youngest conqueror of the world's most prestigious tennis championship; a kind of Napoleonic march towards superstardom, silencing on the way, those big guns like John McEnroe, Jimmy Connors and Kevin Curren.

World Tennis has been topheavy with Americans for quite some time. It was either McEnroe or Connors, all the way, later taken over by Ivan Lendl the Czech superstar. Ever since Bjorn Borg, the genius, bid adieu

the American supermacy went almost almost unchallenged. And then came Wimbledon '85 and the mighty explosion of fresh, youthful energy—Boris Becker.

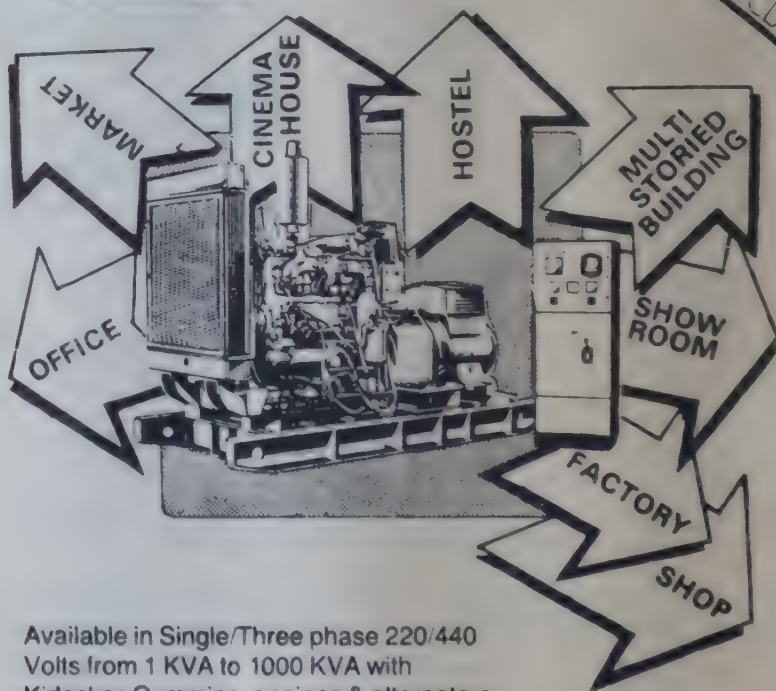
For Becker—who was literally wheeled out of the All England Tennis Courts the previous year, this come back was something to write home about. Even before the Wimbledon, when he won the Queens Club Championship, heads suddenly turned in his direction. But nobody might have bet his money on Becker in the Wimbledon. Obviously, McEnroe was the favourite; then Lendl and Wilander. When Becker put out Curren's fire in the finals, the bookies had to eat dust.

Becker was only two years old in the

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professional tennis circuit when he won the Wimbledon. But for him, two years was enough to acquire all the professional qualities and skills that make top players. He has booming serves followed by a nimble footed rush to the net. He is acrobatic. He would dive for a seemingly unreturnable volley. He would not mind getting dirty, for he is still a kid. He has a powerful forehand and an equally precise backhand.

But, what makes one wonder about Becker is his grit and motivation. During the Wimbledon, even when he was trailing, he never showed any sigh of pressure. He is cool in that sense, but not as cold as Borg. He is a firebrand. During the final struggle, when Curren was in trouble, Becker did not hesitate to put his opponent under more pressure. He deliberately delayed the American's service an extra moment.

For the West Germans, this Leimen boy's triumph over the world's topmost players was some sort of a "poetic justice." The war had put them in a tight corner, and whatever said and done, some kind of guilty conscience crept into their psyche. It was something that could not be shrugged off easily. They wanted someone to put their trade mark on and show the world—there is our hero! Beckenbauer, the great footballer was a hero, but not enough. Then came Becker. He is, for them, more than a hero, an idol. His control-

led aggression on the court is typical German trait. His early coaching in tennis has been a run through fire. Ion Tiriac, the ex-Romanian Davis Cupper explains, "I believe that is the only way to find out how good or bad a player is."

Leimen, the West German town had nothing to boast of except a small cement factory. How things have changed! It is now better known as Becker's birth place. There is not much of tennis in Becker's family. Kare-Heinz, his father, is an architect. But he did something which later turned out to be a jack-pot. He designed a tennis court for the Blue and White club. It was here Becker started wielding his racket.

Becker's triumph in Wimbledon has done West German tennis a world of good. Becker and his men took their Davis Cup team to the final. On the way they overcame the American resistance, Becker winning both his matchless and later the Czech onslaught.

That, Becker brought a sudden whiff of fresh air into the cloggy world of professional tennis, is the most important thing. He is still very young, and has a very long way to go. In the last Wimbledon, he had nothing to lose. Things won't be the same next year. He has to mature but keep the fire in him burning all the while. Only time can prove whether tennis has got another Borg.

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The beginning of a new era

Gramaswaraj in Karnataka

On Wednesday, 14th August 1985, the Karnataka Zilla Parishads, Taluk Panchayat Samithis, Mandal Panchayats and Nyaya Panchayats Act, 1983 came into force (excluding the provisions relating to Nyaya Panchayats). With this dawns a new era in local self-government for over 27,000 villages in the State.

A 3-Tier System

The previous system of Village Panchayats and Taluk Boards, stands abolished with immediate effect, paving the way for the setting up of Zilla Parishads, Taluk Panchayat Samithis and Mandal Panchayats.

The Zilla Parishad, a district level body whose members will be elected, will be in overall charge of all the district's developmental activities.

Under the Zilla Parishads are Mandal Panchayats. As developmental programmes are rarely viable at the 'single village' level, the Mandal Panchayats will be formed on the basis of population—a Mandal Panchayat for every 10-15,000 people encompassing 7-10 villages. The Mandal Panchayats are to be elected and will be responsible for sanitation, health, public works, social welfare, agricultural production, etc.

Both the Zilla Parishads and Mandal Panchayats will be adequately funded by the State Government and also have their own sources of revenue.

Each Taluk will have a Taluk Panchayat Samithi, a nominated body consisting of Legislators. Zilla Parishad members from the Taluk, Mandal Panchayat Pradhans, etc. Its main function will be to advise and assist the Zilla Parishads and review the work of Mandal Panchayats.

In the meantime...

Till the new Zilla Parishads and Mandal Panchayats are constituted after fresh elections, the Administrators already appointed will continue to discharge the functions of the earlier Village Panchayats and Taluk Boards.

A new electoral roll.

Everyone over the age of 18 years is eligible to vote in the Zilla Parishad and Mandal Panchayat elections. New electoral rolls will be prepared for this purpose. The draft rules for the preparation of these rolls have already been published in the gazette.

Gramaswaraj — Power to the People.

**Karnataka
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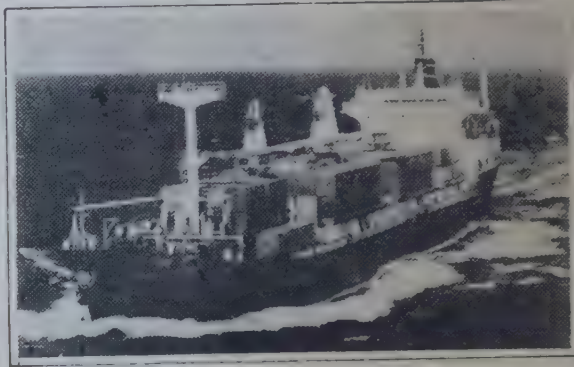
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Highlights

PUBLIC DEPOSIT SCHEMES

- Interest on single deposit of Rs 25,000/- and above will be at the rate of 15% per annum for a period of 2/3 years.
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 - Interest on Fixed Deposits will be paid monthly/Quarterly/Half-yearly or Yearly
 - Interest will be payable subject to deduction of tax, wherever applicable, as per the statute.
 - Acceptance of deposits will be subject to the detailed terms and conditions contained in the prescribed form.
- Note: Widows, Charitable institutions, sharehoideers, employees and interest if paid annually are eligible for 1% extra interest, subject to the ceiling of 15% presently.

FIXED DEPOSIT – SCHEME I

Period	Rates of Interest per annum	
	Public	Shareholders, Employees, Charitable Institutions, Trusts & Widows and if paid Annually
6 Months	13%	13.5%
1 Year	14%	14.5%
2 Years	14.5%	15%
3 Years	15%	15%

Fixed Deposits will be accepted in multiples of Rs. 500/- subject to a minimum of Rs. 1,000/-

CASH CERTIFICATES – SCHEME II

	12 Months	24 Months	36 Months
Issue Price	885	745	640
Maturity Value	1000	1000	1000

DHANA-VRIDHI DEPOSIT – SCHEME III

Amount of Deposit	MATURITY AFTER			
	36 Months	72 Months	108 Months	144 Months
Rs. 1,000	1580	2435	3600	5910

*If renewed after every 36 months onl

CUMULATIVE DEPOSIT SCHEME – IV

Amount of Deposit Rs.	MATURITY AFTER		
	12 Months Rs.	24 Months Rs.	36 Months Rs.
1000	1160	1346	1564
2000	2322	2694	3128
3000	3482	4042	4692
4000	4644	5390	6256
5000	5804	6738	7820
Effective Return p.a. (more than)	16%	17.3%	18.7%

It may be noted that the three years Cumulative Deposit Scheme is more advantageous to the depositor in comparison with the other schemes.

RECURRING DEPOSITS – SCHEME V

Monthly investments of Rs. 15/- upto Rs. 250/- for period of 12 months, 24 months and 36 months attractive rates.

Monthly Deposit of Rs.	MATURITY AFTER		
	12 Months Rs.	24 Months Rs.	36 Months Rs.
15	195	422	748
20	260	562	992
25	325	703	1141
30	390	844	1290
50	651	1408	2250
100	1302	2813	4500
150	1953	4220	6750
200	2604	5626	8992
250	3255	7033	11240

Outstation cheques for Recurring Deposits shall not be accepted.

INFORMATION REQUIRED TO BE FURNISHED IN TERMS OF PROVISIONS OF THE NON-BANKING FINANCIAL COMPANIES AND MISCELLANEOUS NON-BANKING COMPANIES (ADVERTISEMENT) RULES 1977.

(a) Name of the Company	: MADRAS MOTOR FINANCE & GUARANTEE COMPANY LIMITED	
(b) Date of Incorporation	: 10th September, 1975	
(c) Business carried on by the Company and its subsidiaries with details of branches	: To provide Hire Purchase & Leasing Finance The Company has subsidiary viz., SOUTH INDIA INVESTMENTS & FINANCIAL CONSULTANCY LTD., which is engaged in the business of an Investment Company. The Company has its branches at Nellore, Pondicherry (Union Territory), Cuddalore (South Arcot District), Coimbatore, Karaikudi, Madurai, Kumbakonam, Trichy, Trivandrum, Cochin, Bangalore, Madras, Vijayawada and Bombay.	
(d) Brief Particulars of the management of the Company	: The Company is managed by a Chief Executive under the control and supervision of the Board of Directors.	
(e) Names, Address and Occupations of Directors:		
NAME	ADDRESS	OCCUPATION
Shri. T.N. LAKSHMINARAYANAN, IAS (Retd.) (Chairman)	BL/AA99, Anna Nagar, Madras 600040	Retired I.A.S. Officer & Company Director
Mr. V.B. DESAI (Vice-Chairman)	201, Debonair, Vir Savarkar Marg, Bombay 400022	Stock and Share Broker and Company Director
Mr. V.K. SUNDARAM	35 Neelakantha Mehta Street, T. Nagar, Madras 600017	Stock & Share Broker and Company Director
Mrs. USHA NAIR	51, M.R.C. Nagar, Madras 600028	Stock & Share Broker and Company Director
Mrs. RM. SOLAICHI	12, Sir C.P. Ramasamy Iyer road, Alwarpet, Madras 600018	Stock & Share Broker and Company Director
Mr. M.V. VALLIAPPAN	Pudumani 11 Street, Rayavaram, Pudukkottai Dist	Industrialist
Mr. J. VENKATARAMANA, Ph D	79 G.N. Chetty Road, T. Nagar Madras 600017	Stock & Share Broker and Company Director

(f) & (g) Profits and Dividends Details of the Profits and Dividends are given below

Profits: Year ended	Profit before provision for tax	Profit after provision for tax	Dividend
30th June, 1983	Rs. 14,66,826/-	Rs. 6,92,991/-	14%
30th June, 1984	Rs. 15,02,098/-	Rs. 7,87,573/-	18%
30th Sept. 1985	Rs. 45,09,228/-	Rs. 39,16,552/-	24%

Contd....

(h) Summarised Financial Position of the Company as appearing in the two latest audited Balance Sheets

LIABILITIES	30.9.85	30.6.84	ASSETS	30.9.85	30.6.84
	Rs.	Rs.		Rs.	Rs.
Share Capital	1,15,00,000	45,36,875	Fixed Assets	1,00,67,214	43,82,973
Calls in advance	9,60,213	2,750	Investments	22,07,549	8,64,076
Reserves & Surplus	57,73,372	10,12,768	Current Assets	5,70,99,158	3,36,71,139
Secured Loans	1,12,712	—	Loans & Advances	1,59,33,956	81,57,994
Unsecured Loans	5,11,24,266	3,06,98,125	Misc. Expenditure	43,97,910	7,40,951
Current Liabilities	1,42,16,120	86,45,088	Profit & Loss Account	—	—
Provisions	60,19,104	29,21,527			
Total	8,97,05,787	4,78,17,133	Total	8,97,05,787	4,78,17,133

Contingent Liability in respect of Partly paid-up shares Rs. 57,000

Contingent Liability in respect of Gratuity Rs. 23,566

(i) We can raise by way of deposits under direction Rs. 849.66 lacs and our deposits as on 30th September, 1985 is Rs. 498.96 lacs

(j) The Company has no overdue deposits, other than unclaimed deposits as on the date of this advertisement

(k) The Company hereby declares

i) That the Company has complied with the provisions of the directions applicable to it

ii) That the compliance with the directions does not imply that the repayment of deposits is guaranteed by the Reserve Bank of India; and

iii) That the deposits accepted by the Company are unsecured, ranking pari passu with other unsecured liabilities

The text of this advertisement has been approved by the Board of Directors of the Company by a Resolution dated 16.12.1985 and a copy of its has been submitted to the Reserve Bank of India for approval

Dated: 16.12.1985

By Order of the Board,
For MADRAS MOTOR FINANCE & GUARANTEE COMPANY LIMITED
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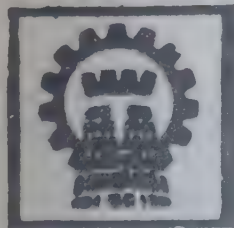
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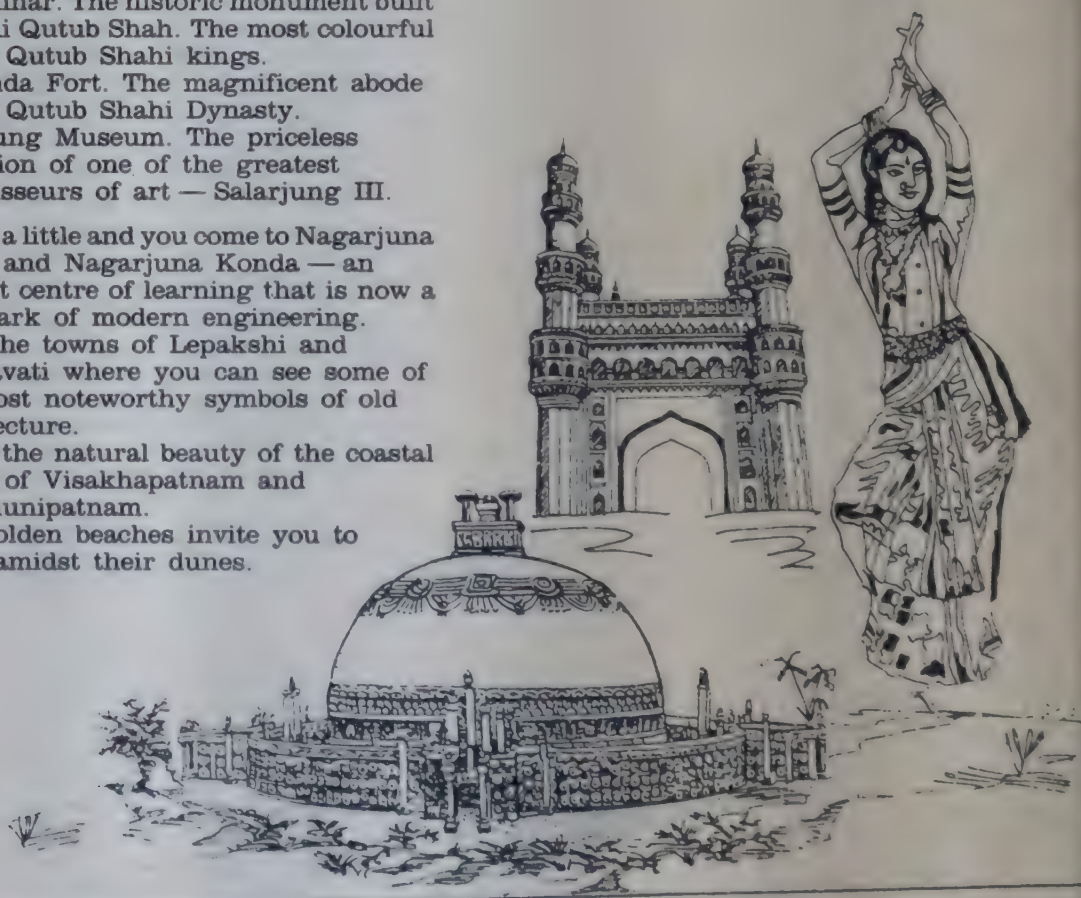
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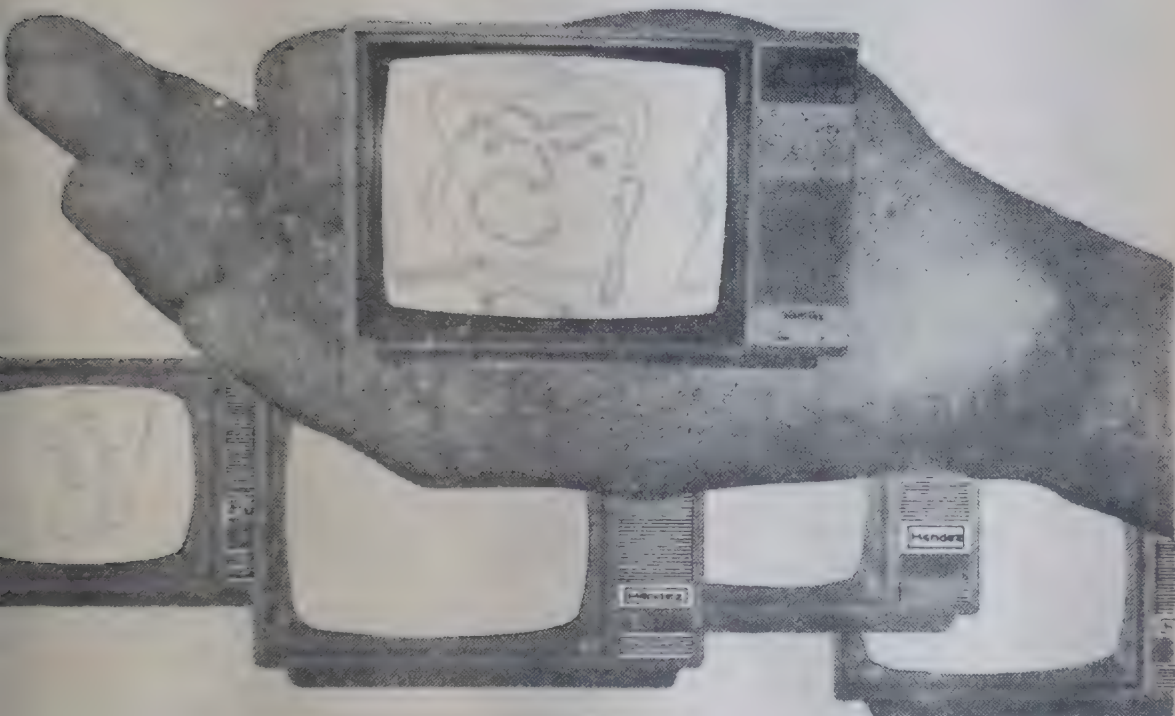
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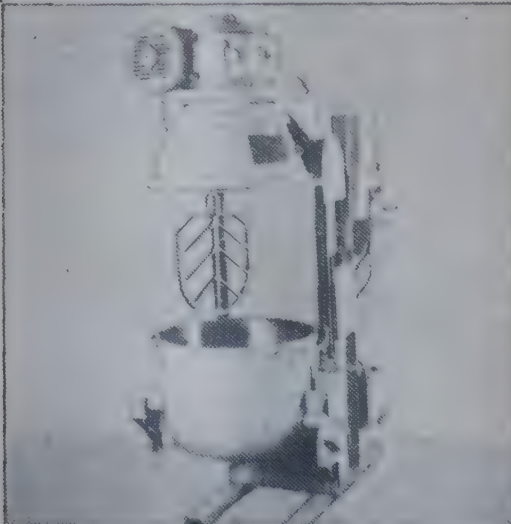
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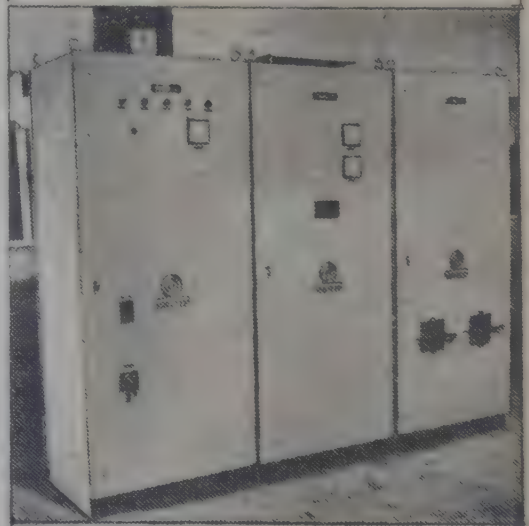
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- Thermoscan with printer
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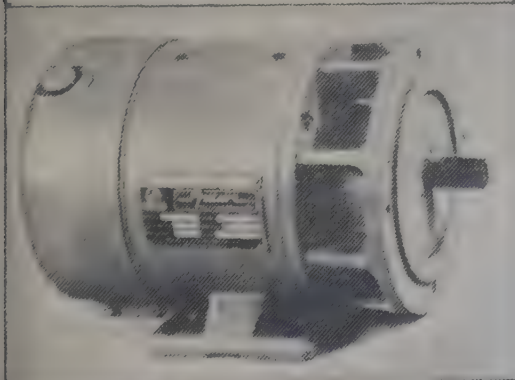
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• Microprocessor-based temperature scanners

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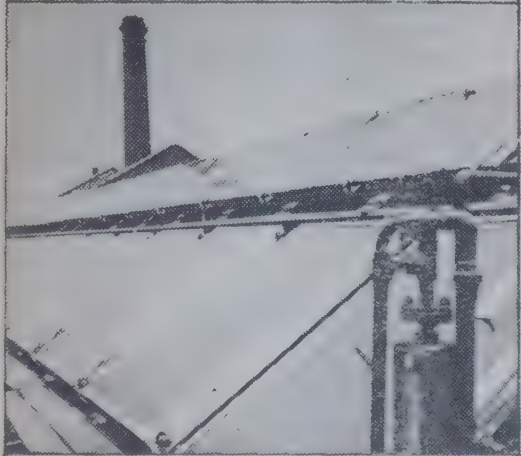
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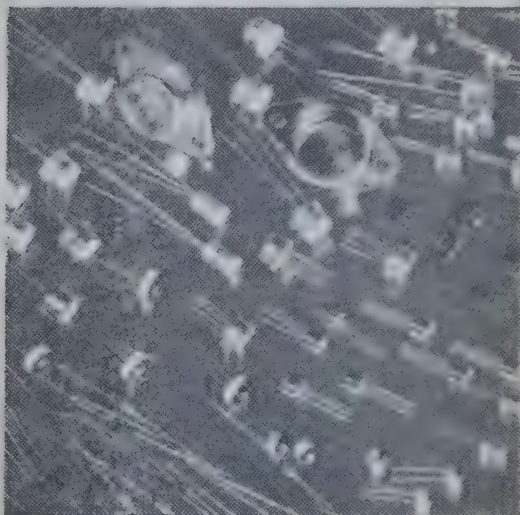
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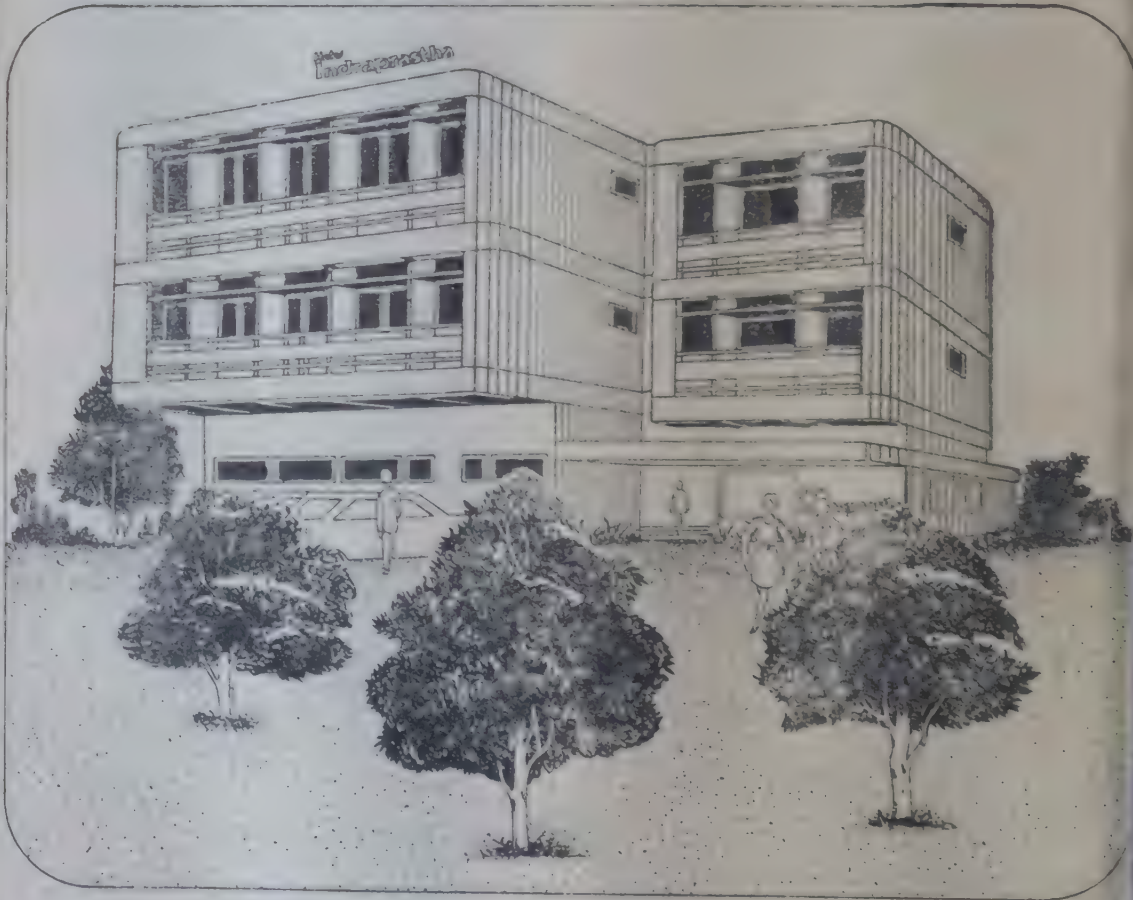


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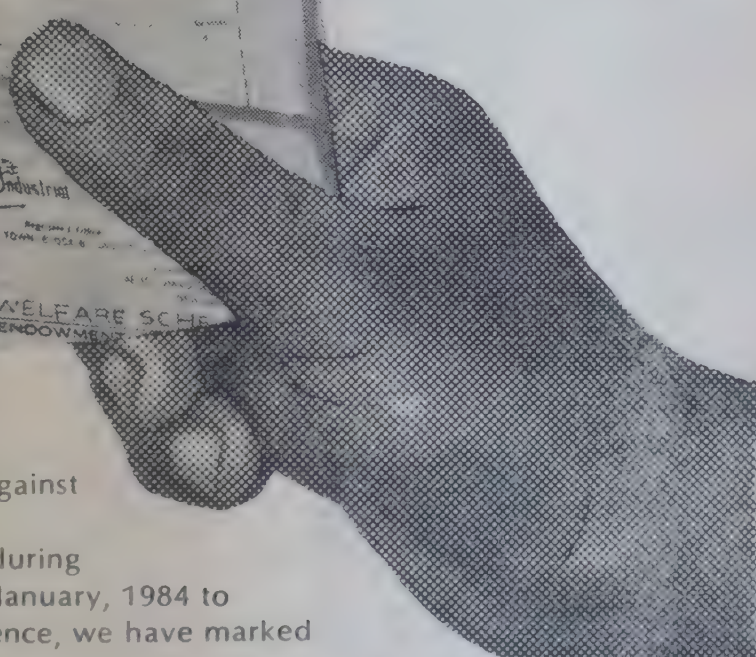
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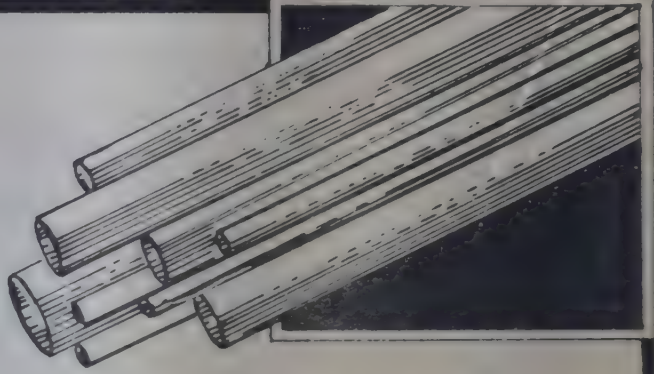


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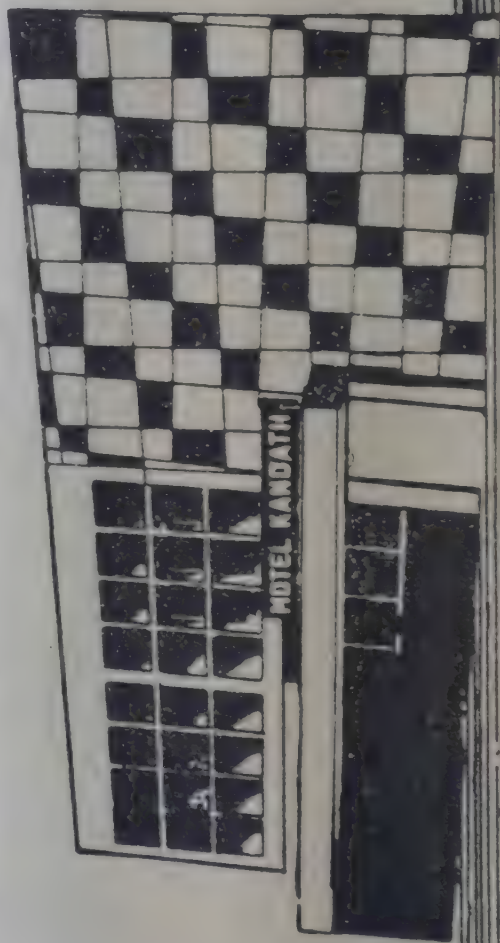


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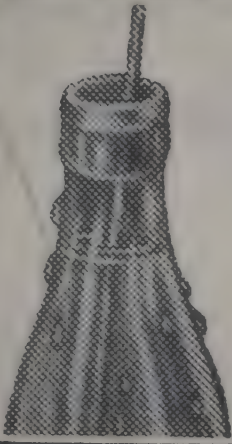
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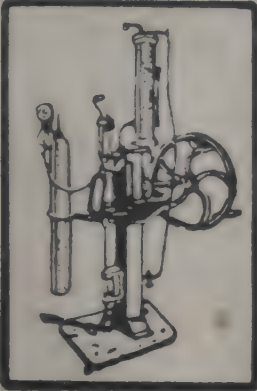
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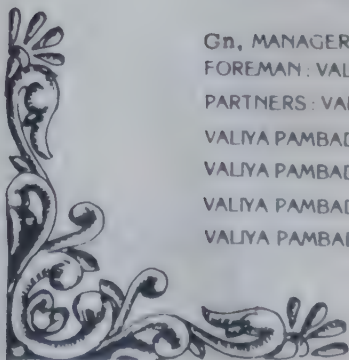
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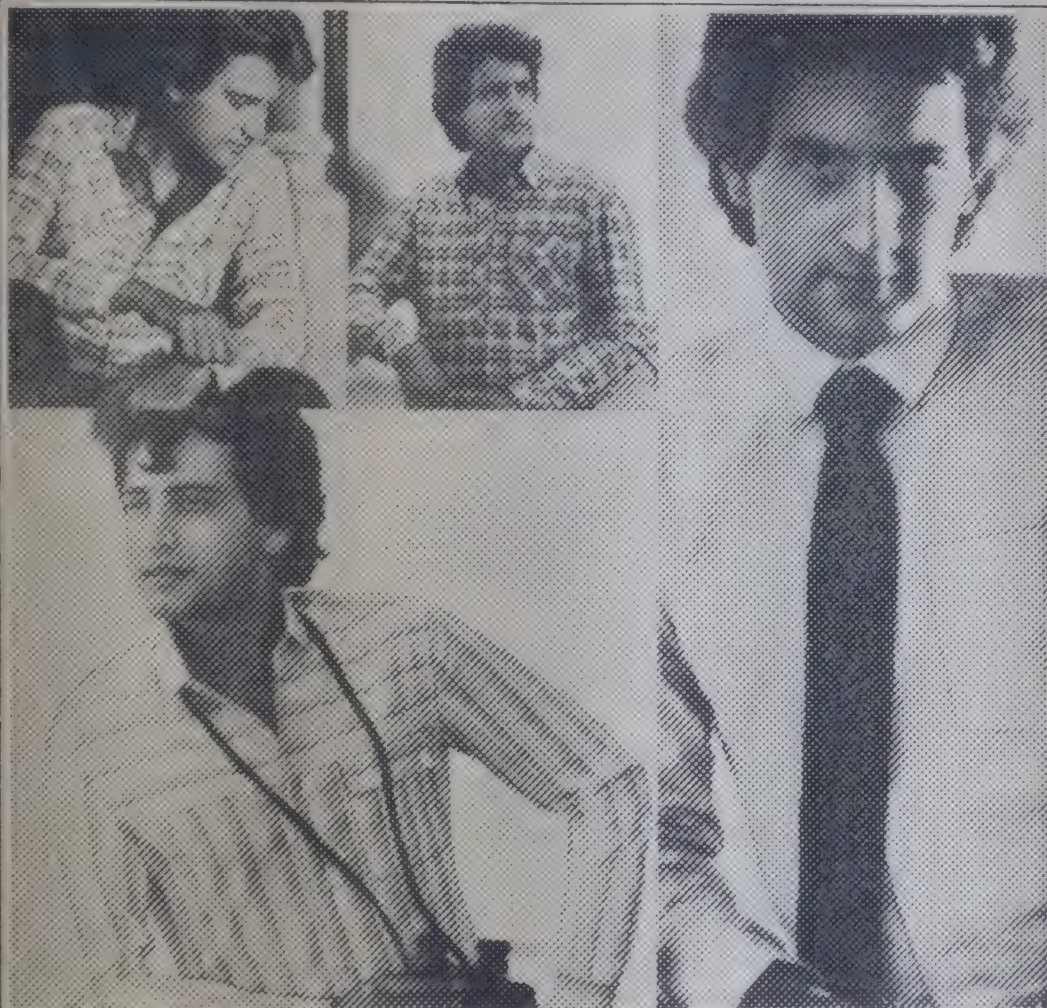
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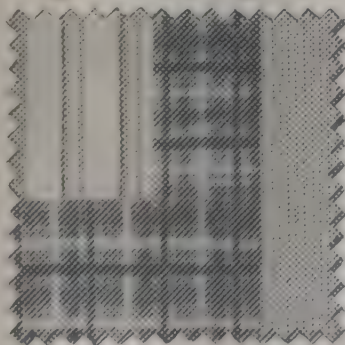
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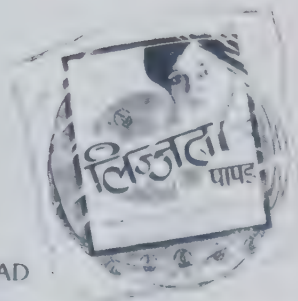
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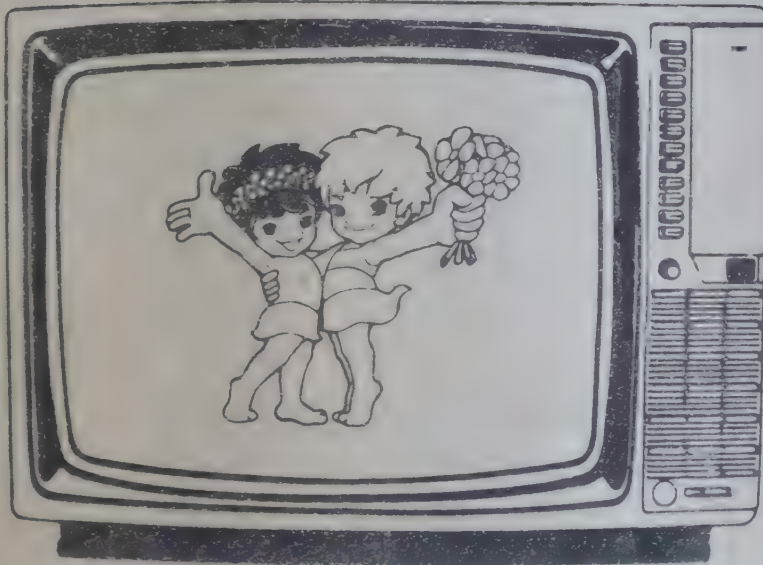
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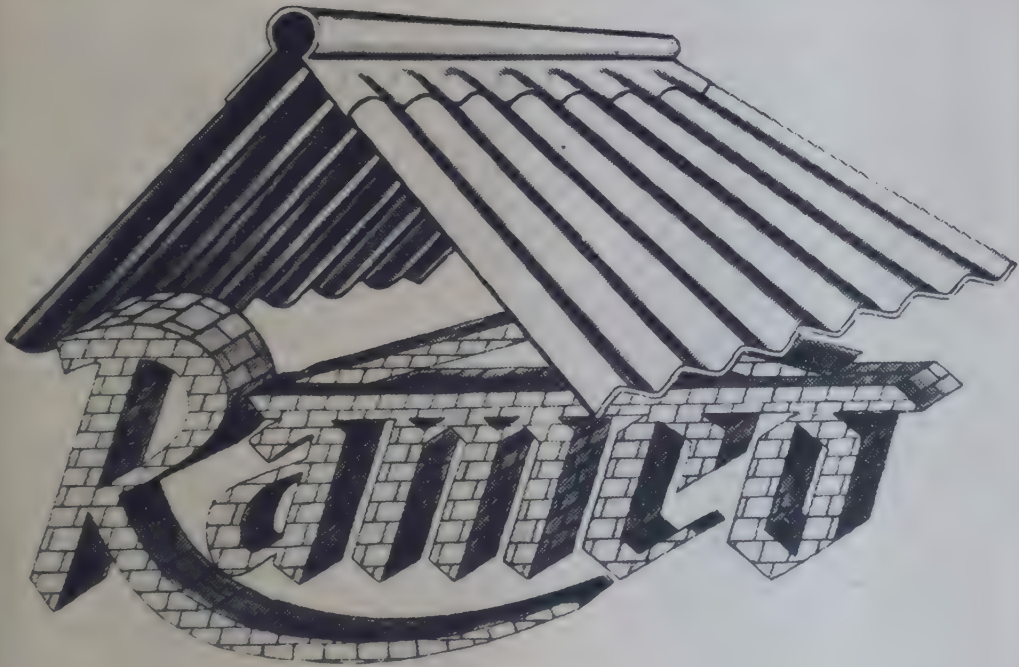
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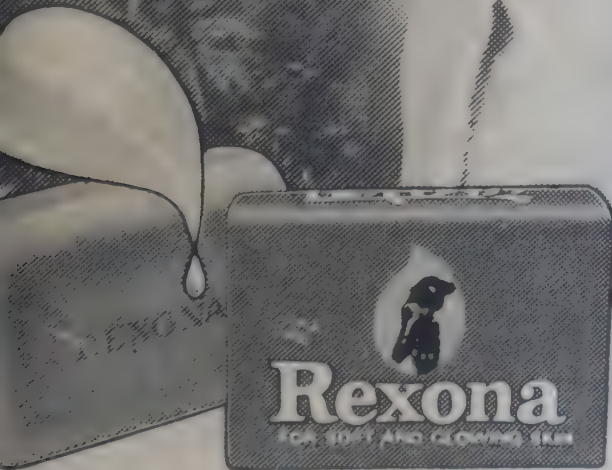


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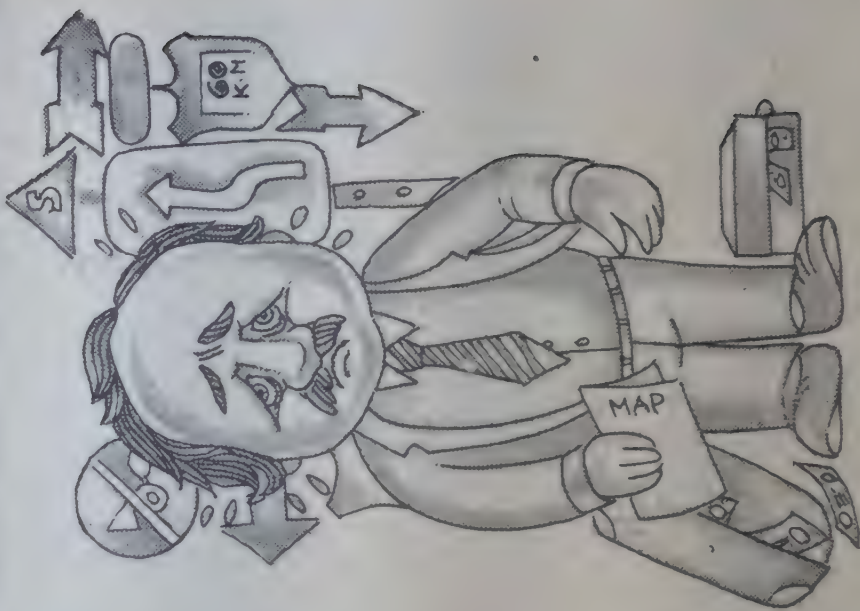
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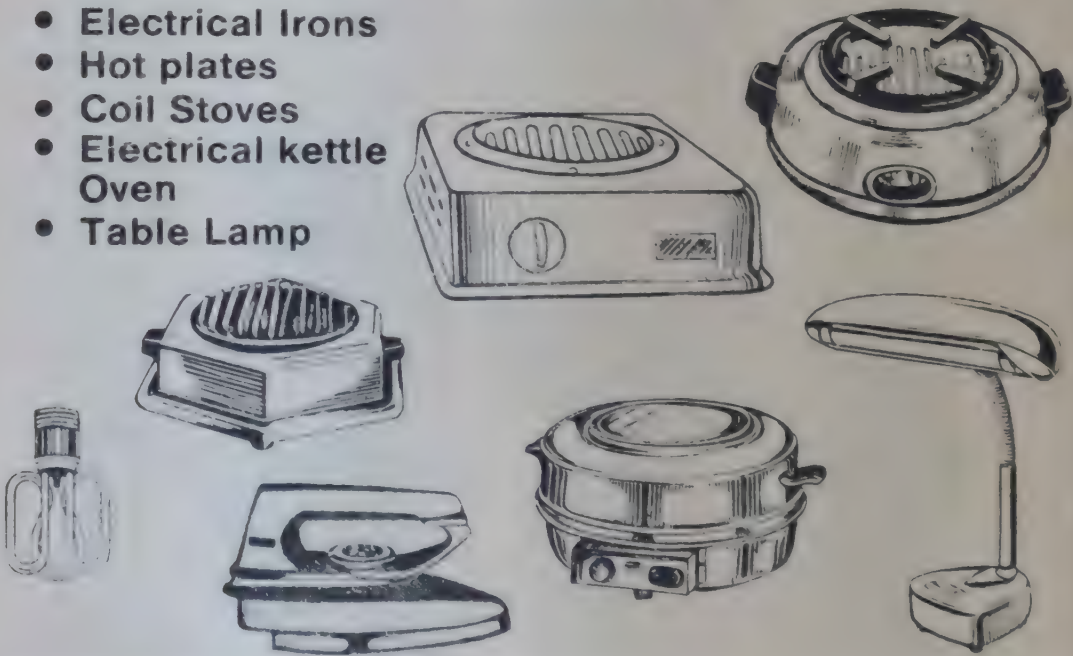
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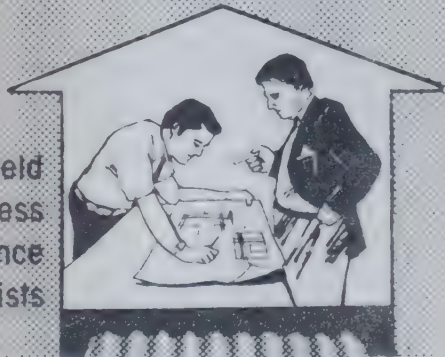
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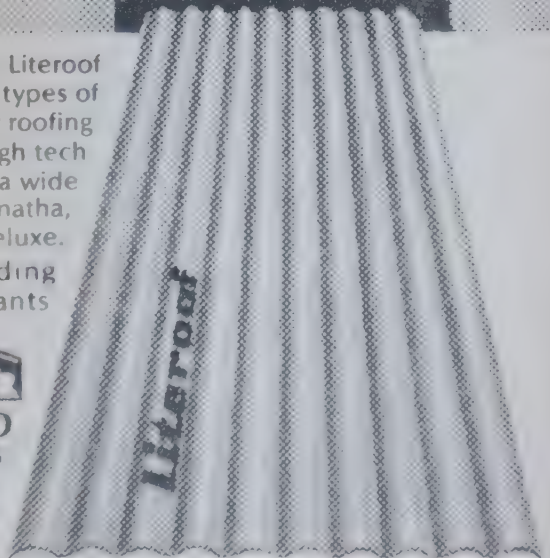


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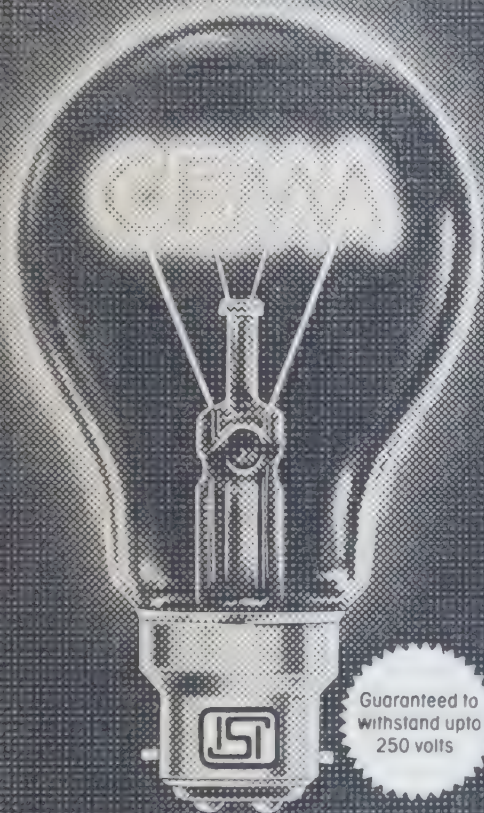
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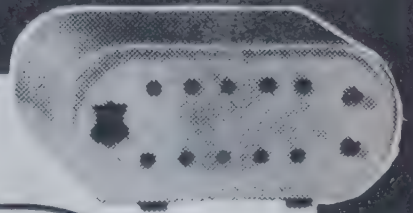


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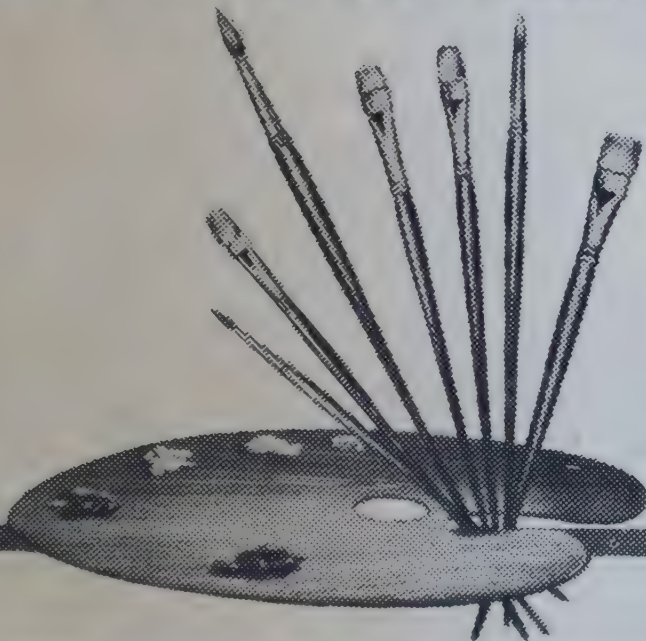
- Special assistance provided to 2.16 lakh below poverty line families under Integrated Rural Development Programme of which 52,670 families belong to Scheduled Castes and 35,398 families to Scheduled Tribes.
- Financial assistance to over 2 lakh families belonging to Scheduled Castes and Scheduled Tribes.
- Rehabilitation of 319 bonded labour families.
- 327.37 lakh mandays employment provided under National Rural Employment Programme.
- Drinking Water Supply Schemes implemented on priority basis in rural areas mitigating problem of 3,025 difficult villages.
- Additional 76,556 agricultural pumps energised and 1,194 villages electrified.
- 5,284 hectares of surplus land distributed to landless labourers.
- 49,926 Bio-gas plants set up as alternative source of energy thereby exceeding the target by 200 per cent.
- 1.944 lakh trees planted.
- Maintained lead in implementation of family welfare programme by performing 5.65 lakh sterilisations. Secured national award of Rs. 2.5 crores for the second year in succession.
- Fulfilled the target of setting up 1,062 additional primary health centres under the 'Health For All by 2000 A.D.' Programme in 1983-84, well ahead by 10 years.
- Established 650 primary health sub-centres and 16 Integrated Child Development Blocks.
- For generating more employment opportunities 34,900 rural industries and small industries set up.
- Bagged National award for girls' education and adult education.
- Allotment of house sites to 17,144 rural landless families and financial assistance for construction of 24,629 houses.
- Three lakh slum-dwellers covered under Slum Improvement Programme.

20-Point Programme for the Masses - Maharashtra on the forefront.

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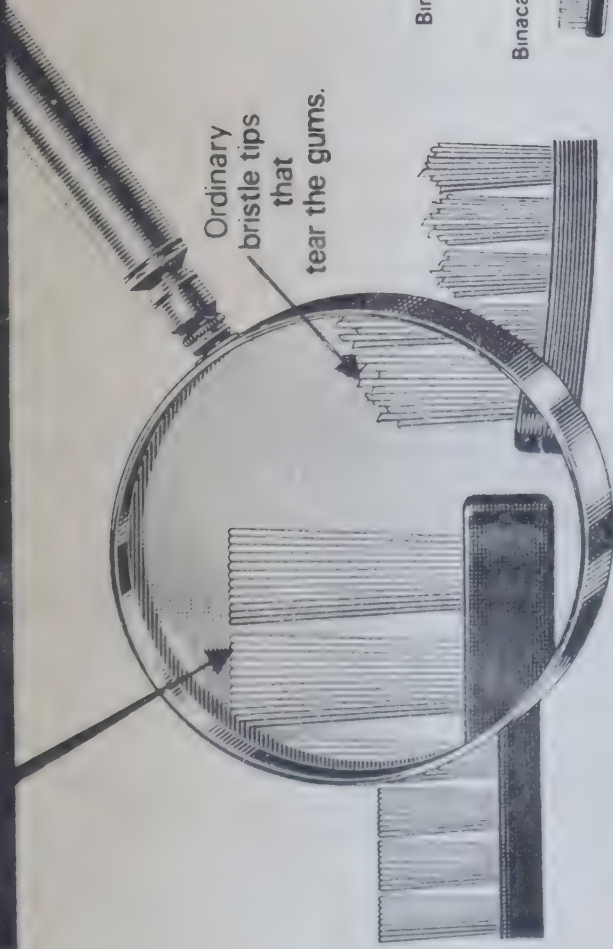
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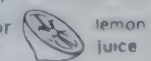
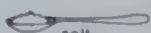
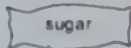
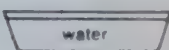
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Sodium Bicarbonate 2.5 g
(or ½ teaspoon soda bicarb)

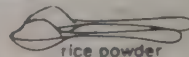
Potassium Chloride 1.5 g (or
a little lemon juice)



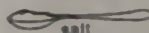
Give at least 4-6 glasses a day.

INTERNATIONAL CENTRE FOR DIARRHOEAL DISEASE RESEARCH (ICDDR DHAKA) FORMULA

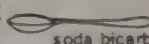
Rice powder—50 g (or
2 heaped tablespoons)



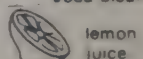
Sodium Chloride—3.5 g (or
½ teaspoon common salt)



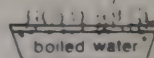
Sodium Bicarbonate—2.5 g
(or ½ teaspoon soda bicarb)



Potassium Chloride—1.5 g
(or a little lemon juice)



This is to be dissolved in
1050 ml or just over one
litre of water and boiled
for 4-5 minutes.



This preparation can be stored for 5-6
hours at room temperature and for 24
hours in a refrigerator.

You can also give the child fluids like weak
tea, buttermilk and rice water, where rice is
drained off and salt is added to the water.

If your child is able to eat, give ripe bananas,
soft rice, curds, bread, mashed potatoes
and biscuits. Breast feeding should be
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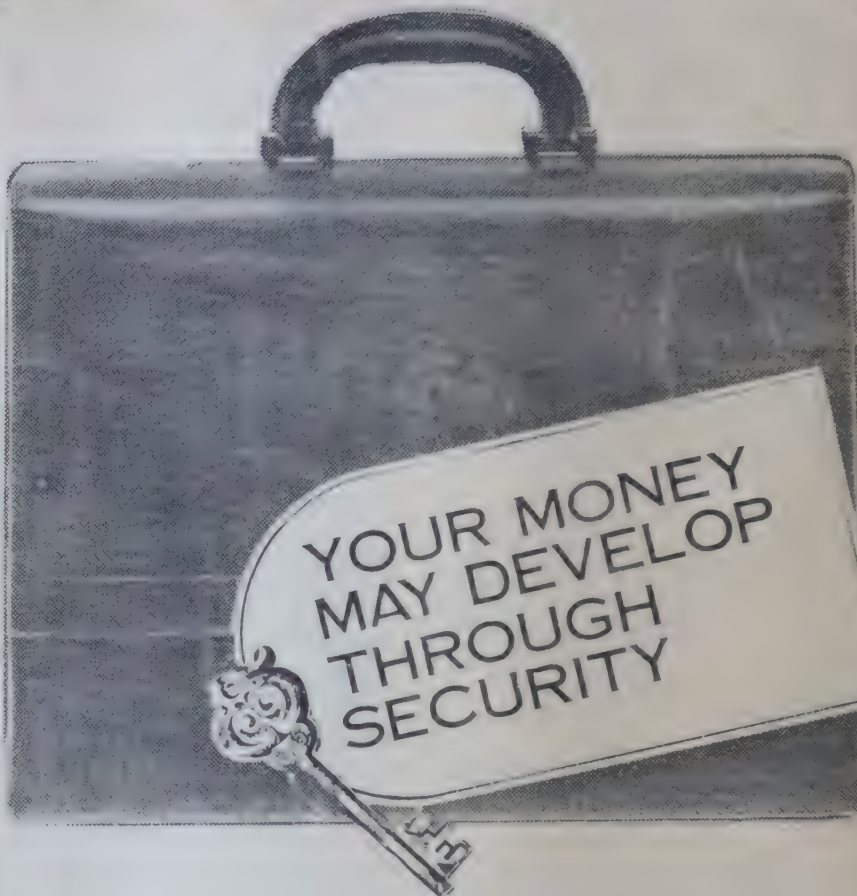
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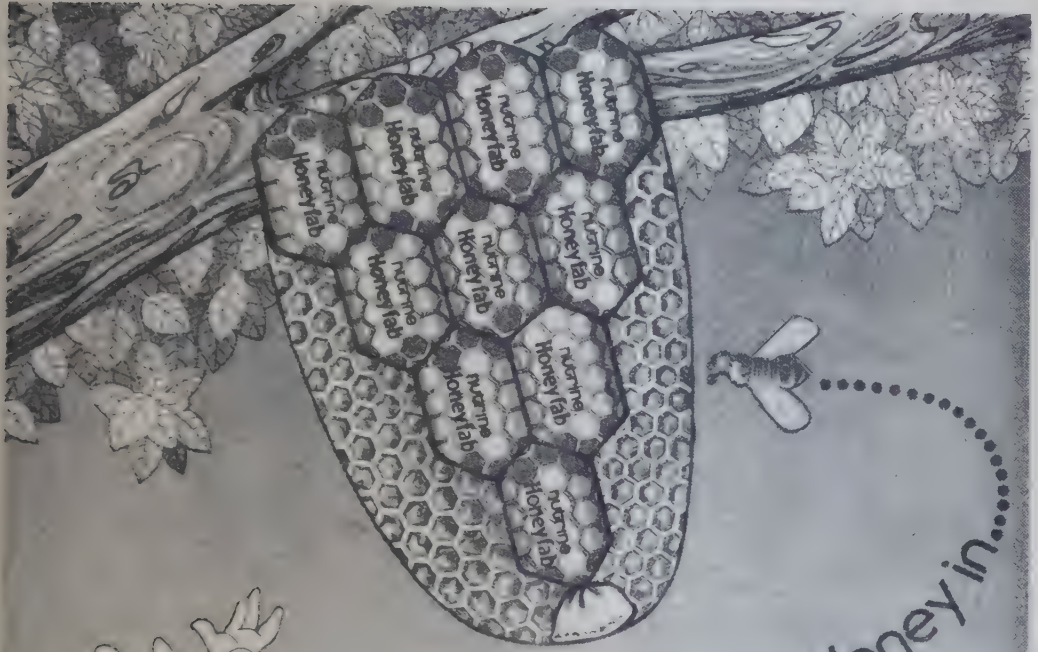
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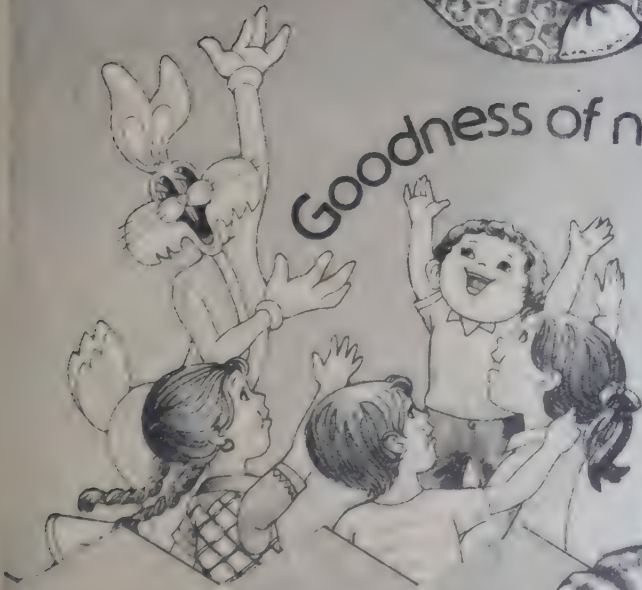
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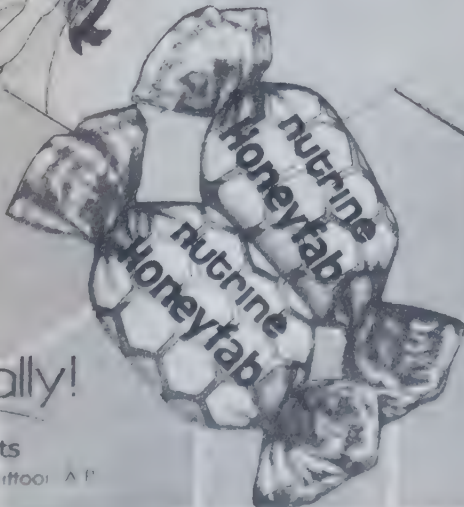
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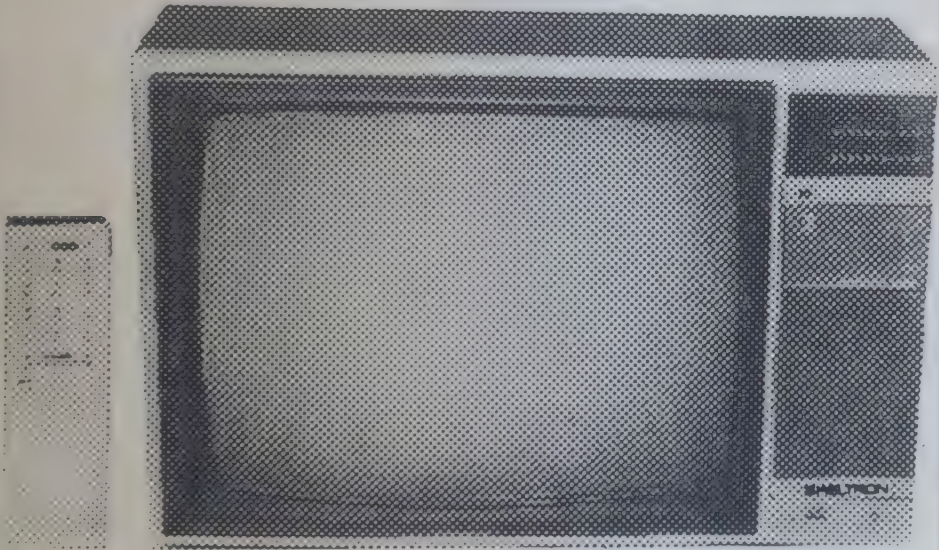
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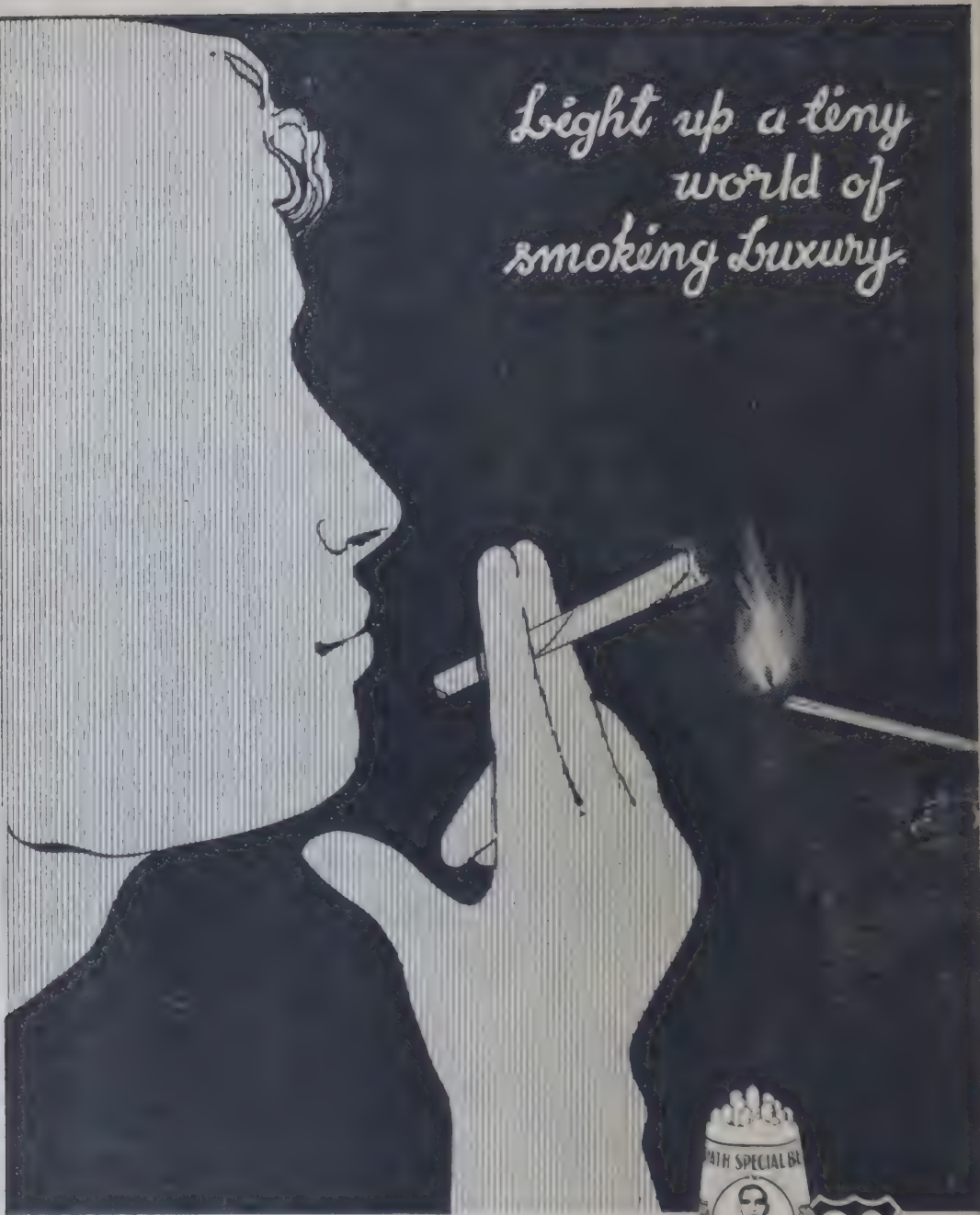
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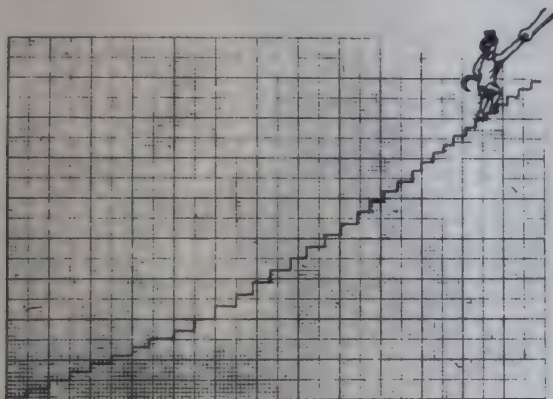
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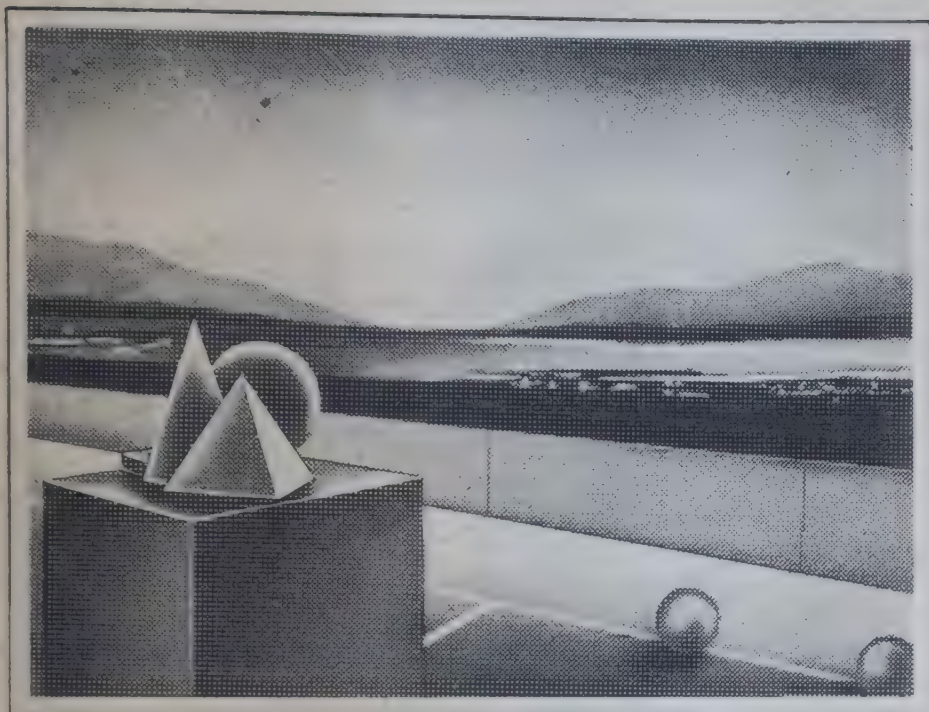
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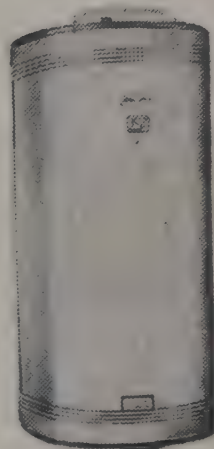
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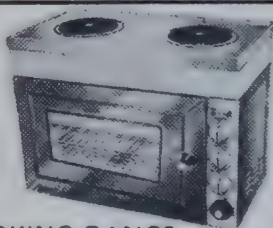
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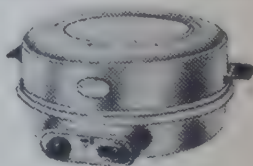
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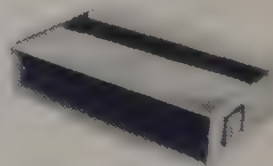
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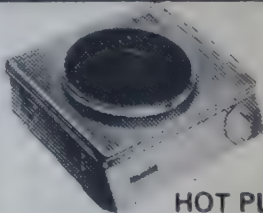
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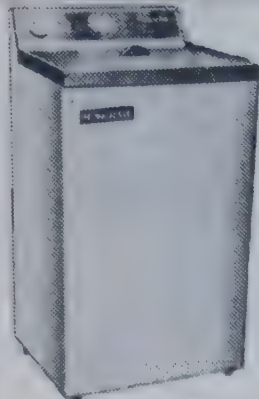
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INDEX

A			
Alker Sandhane	428	Aldebaran	85
Abbreviations	237	Aldrin, Edwin	102, 109
Abel Aziz Abdel Ghani	356	Alexander the great	214, 653
Abdulla, Dr. Farooq	228, 433	Aledander, Dr. P.C.	688, 690
Abdulla, Sheikh	423, 431	Alexander's invasion of India	398
Abdus Salam	204	Alfonsin, Dr. Raul	306
Abdian	327	Algeria	305
Adm treaty	390	Alhambra at Granada	231
Adraham	213, 262, 343	Ali Abdulla Saleh	356
Adraham, Shiny K.	715	Alia, Ramiz	305
Adbsolute zero	70, 183	Aligarh Muslim University	587
Ad Dhabi	351	Ali, Mohammed	410
Ad Mount	262	Ali Nazar Mohammed	356
Adyssal plains	126	All about Eve	273
AdBA group	272	Allahabad Bank	499
Adcra	312	All Assam Gana Sangram	
Adkworth Committee	547	Parishad (AAGSP)	480
Adoncagua	121	All Assam Students Union	
Adquino, Benigno S.	226	(AASU)	480
Adquired Immune Deficiency		Allergen	152
Syndrome (AIDS)	195	Allied victory in war	219
Adupuncture	193	All India Grid	506
Adams	99	All India Handloom Board	528
Adis Ababa	318	All India Newspaper Editors	
Adelaide	307	Conference (AINEC)	583
Ad	674	All India Radio	571
Ad Granth	263, 653	All India Sikh	
Adilshahis of Bijapur	679	Gurudwara Bill	479
Adivasas	451	Allopathy	195
Advaita	260	Almagest	113
Advocate General	460	Almora	667
Adfloat	235	Alphabetical writing	213
Adrolites	107	Alps	121
Adschylus	263	Alvarez, Dr. Luis W.	110
Adrop	264	Alvarez, Luis Alberto Monge	315
Adorestation	542	Alvars, the	661
Adghanistan	305	Alwar	656
Adghanistan, war in	303	Amalthea	97
Adfrican-Negro languages	254	Amaravati, the	660
Adartala	663	Amarnath	633
Adathi	681	Amarsinh Choudhury	478
Adgarwal, Asha	688	Amazon, the	126
Adgra	666, 678	Ambrosian period	271
Adgricultural marketing &		Amendment to Constitution	461
warehousing	540	American Declaration of	
Adgricultural Prices Commission	484	Independence	217
Adgricultural production statistics	534	American-Indian languages	254
Adgricultural Refinance		American war of	
AdCorporation	498	independence	402
Adumsa	260	Amini	681
Adumadnagar Sultanate	618	Amino acids	160, 164
Adumadabad	627	Amman	329
Adumed, Sahim	349	Ampere	190
Adumed Shah Abdali	644, 653	Amrik Singh	435, 479
Adoms, the	621, 622	Amrita Bazar Patrika	581, 582
Adurman	263	Amritsar	263, 653, 655
Adura Mazda	263	Amritsar, treaty of	632
Adnu	254	Amsterdam	337
Adr Corporation Act	559	Ana Krakatoa	120
Adr Force	518	Analects	258
Adr India	559	Anamalai Sanctuary	663
Adports Authority	561	Anand, Mulk Raj	266
AdR Stations	573	Anandpur Sahib Resolution	478
Adx-la-Chapelle, treaty of	686	Andaman group of islands	671
Adzwal	684	Andes	121
Adanta	645	Andhra Pradesh	618
Admer	656	Andorra	306
Adta	674	Andorre-la-vieille	306
Adtali Dal Ministry	478	Andromeda galaxy	80, 81
Adkal Takht	479	Andropov, Yun	225
Adkash Ganga	82	Andros	307
Adkhar emperor	216, 398, 623	Andrott	681
Adkadians, the	212	Aney, M.S.	417
Adklachak	324	Angamus	649
Adkosh wins award	428	Angiogenesis	199
Adam Ara	578	Angiogenin	199
Adania	305	Angkor Wat	231
		Anglo-Irish Agreement	352
		Angola	306
		Angra Mainyu	263
		Angstrom, Anders	70
		Angstrom unit	69, 70
		Angula	358
		Animal husbandry	392
		Anjengo	638
		Anjah, T.	427, 599
		Ankara	351
		Ankleshwar	627
		Ansupa lake	650
		Antartica expedition	429, 432
		Anthropology	146
		Anthropometry	146
		Antigens	152
		Antigua & Barbuda	306
		Antilles	361
		Antiper of Sidon	228
		Anti-Satellite (ASAT) capability	390
		Anushilan Samithi	405
		Aos, the	649
		Apartheid	281, 345
		Apatani	674
		Apia	356
		Apollo discoveries	102
		Apollo missions to the moon	109
		Apollos asteroids	106
		Apollo-XI et al	101
		Appalachians	121
		APPLE, launching of	428, 606
		Appleton	251
		Apprentices Act	596
		Appropriate technology	712
		Appropriation Act	487
		Aptidon, Hassan Gouled	317
		Aqunas	169, 264
		Arab League	289
		Arafat, Yasser	303
		Arakkal, House of	682
		Arap Moi, Daniel	330
		Arasalar, the	686
		Aravallis	121, 439
		Argentina	306
		Arane Launch Vehicles	606
		Arif, Mohammed Usman	668
		Anrtrarchus of Samos	113
		Aristophanes	264
		Aristotle	169, 264
		Arjan Mahal, Guru	263
		Arjuna Awards	376
		Arjun Singh	479
		Arkavati, the	634
		Armalcolite	102
		Armed Forces Chiefs	702
		Armed Forces Medical College	519
		Arms Act, the	402
		Armstrong, Neil	102, 109
		Army	516
		Arnold, Mathew	270
		Artemisia, Queen	229
		Arunachal Pradesh	621, 674
		Aryabhata	423, 606
		Aryans	259
		Aryan settlements in India	213
		Arya Samaj	260
		Asaf Jah	618
		Asan World Prize	371
		ASAT, testing of	227
		A-scope	78
		Ashford, Evelyn	716
		Ashoka, emperor	214, 623, 651
		Ashok group of hotels	612
		Asiad Medals Table	719
		Asian Development Bank	298
		Asian Games	718
		Asian Pacific Postal Union	565
		Asimov, Isaac	66
		Asoka	398
		Assam	620
		Assam Accord	480, 692

Assamese	455	Bahamani dynasty	398	Betancur, Dr. Delisario	341
As Shaab (Aden)	356	Bahrain	307	Betelgeuse	83
Association of South East Asian Nations (ASEAN)	289	Bahuguna, H.N.	471	Betta	625
Assyrians, the	212	Baig Murad Ali	250	Betul, the	679
Asteroids	105, 106	Baitarani, the	650	Betwa, the	640
Asthenosphere	115	Bajaj Award	376	Beyond the speed of light	203
Astronomical Unit	69	Baker, Dr. Donald C.	88	'Beyond War' Prize	372
Astronomy, modern	71	Bakrid	261	Bhabha Atomic Research Centre (BARC)	512
Aсуhi	653	Balanced diet, composition of	164	Bhabha, Homi	203, 422, 512
Asuncion	340	Balance of trade, adverse	503	Bhagavad Gita	259
Aswan High Dam	251	Balasore	608	Bhagadatta	622
Atharva Veda	258	Balearc Is.	362	Bhagurathi, the	685
Athenian laws, publication of	213	Bamako	334	Bhagwan, the	61
Athens	321	Banas, the	626, 655	Bhajan Lal	630
Athletics	723	Banda, Hastings Kamuzu	333	Bhaktumarga	260
Atkov, Oleg	112	Bander Seri Begawan	310	Bhandari, N.B.	660
Atlantis	112	Bandipur wild life sanctuary	636	Bharadwaja	666
Atlas mountains	305	Bandung conference	220, 294	Bharata dynasty	628
Atmosphere	115, 128	Banerjee, Ashok Nath	636	Bharatapuzha	440, 441
Atolls	123	Banerjee, S.	528	Bharat Coaking Coal	508
Atom for peace	511	Banerjee, Surendranath	402, 408	Bharatiya Jana Party	427, 471
Atomic bomb on Hiroshima & Nagasaki	219	Banerjee, W.C.	403	Bharatiya Lok Dal (BLD)	470
Atomic Clock	184	Bangalore	633, 636	Bharatiya Yatri Avas Vikas Samiti	609
Atomic Energy Commission	515	Bangaram	681, 684	Bharat Petroleum Corporation Ltd.	509, 510
Atomic power	253	Bangkok	350	Bharatpur	656
Atomic time	184	Bangladesh	221, 308, 422	Bharphakans	622
Attenborough, Sir Richard	225, 577	Bangu	313	Bhasa	264
Attorney General	460	Bank Hapoalim of Israel	502	Bhaskara	426, 429, 606
Aubert, Pierre	349	Banks, nationalisation of	422	Bhatnagar Award	376
Audio Conferencing	704	Banswara	656	Bhat, N.C.	606
Audit Bureau of Circulation Ltd. (ABC)	582	Bantam	686	Bhatinda	655
Augmented Satellite Launch Vehicle (ASLV)	607	Barak, the	684	Bhatvadekar, Harishchandra	578
Aurangzeb, emperor	399	Barauni Refinery	509, 625	Bhavabhuti	264
Aurignacean industry	208	Barber, Samule	271	Bhavan, the	660
Aurora Australis	94	Barbados	308	Bhave, Vinobha	431
Aurora Borealis	94	Barnala, Surjit Singh	480	Bhilai Steel Plant	642
Auroville	687	Barnard, Dr. Christian	232	Bhils, the	641
Austen, Jane	267	Barnard's star	92	Bhima, the	634, 643
Australia	306	Barrier Reef, the great	123	Bhumbandh	655
Austria	307	Bartholomew Diaz's voyage	216	Bhindranwale, Jarnail Singh	228, 435, 478, 479
Austrian Succession War	686	Basal metabolism	168	Bhishma Narayan Singh	623, 649
Austrian languages	254	Basketball	726	Bhopal	640, 642
Austrians of India	446	Basketry	210	Bhoval Gas Tragedy	382, 600
Authorised Version of the Bible	217	Basque language	254	Bhubaneswar	650, 652
Auxiliary Population System Unit (APSU)	605	Basseterre	346	Bhutai, the	647
Aviation, platinum jubilee of	560	Basu, Jyoti	430, 436, 670	Bhumibol Adulyadej Abuldet, King	350
Avicenna	193	Bathurst	320	Bhutan	309
Awards & Honours	362	Batmunkh, Dr. Jambyn	335	Bhutias, the	659
Ayatollah Khomeini's return to Iran	223	Baudry, Michel	201	Bible Hebrew	262
Ayodhya	666	Baumann, Alex	715	Bidar Sultanate	618
Ayurveda	193	Baxi commission	477	Bihar	623
Azad, Abul Kalam	411, 418	Bay Islands	672	Bijapur Sultanate	618
Aziz, Mohamed Abde	336	Bay, Zoltan	74	Bikaner	656
Azmi, Shabana	374	Beas, the	440, 631, 653	Bilaspur	631
Azores Islands	361	Beatles, the	272	Billiards	727
B		Beatrx Wilhelmina, Queen	337	Bill of Rights in England	217
Babangida, Ibrahim	338	Beathe, Sir David	338	Big Bang theory	67, 206
Babar	653	Becker, Boris	751	Binaries	63
Baby from Nobel Sperm bank	225	Becquerel, Henrie	m70	Biogas	253, 507
Babylonians, the	212, 216, 262	Beedi & Cigar Workers Act	598	Biology, the new	148
Bach, C.P. Emmanuel	271	Beethoven, L.	267, 271	Biosphere	115, 133
Bacterium, the	149	Beggs, James M.	111	Birbal	666
Badaga	454	Beg, M.H.	428	Birendra, King	331
Badagara, ruler of	686	Belgium	308	Birkenhead, Lord	414
Badai, Prakash Sing	478	Belgrade	357	Birla, B.M.	428
Badanchandra	622	Beijing (Peking)	314	Birla, G.D.	431
Bedkhal lake	629	Beirut	331	Birla Mandir	678
Badminton	725	Bellow, Saul	267	Birla, R.D. Award	378
Badrinath	260, 666, 667	Belmopan	308	Bismarck	320
Bagaza, Jean-Baptiste	312	Benaras Hindu University	587, 588	Bissau	321
Baghdad	326	Bengal Gazette	580	Bitra	68
Bahadur Shah	679	Bengali	455	Biya, Paul	312
Bahamani Sultans	679	Bengal, partition of	399, 404, 668	Black holes	8
Bahamas	307	Benhur	273	Black money	528
		Benun (Dahomey)	309	Blaise, Herbert	321
		Benn, Wedgewood	415	Blanco, Salvador Jorge	317
		Bentick, Sir William	399	Belize	308
		Berezovoi, Anatoly	234	Block mountains	12
		Berlin	320	Blood freezing	18
		Bermuda	309		
		Bernudez, Juan de	309		
		Berne	348		
		Besant, Annie	411		

ueford, Guion S.	112	C	Chakravarti, Prithvis	583
ue Mountain Peak	684		Chalcolithic age	210
umenbach	146	Cabinet Ministers	601	212
uoit, Joan	715	Cabinet Mission	418	626
uoat race	727	Cachar	622	398, 635, 679
uooh, Gaya	257, 625	Caenozoic era	142	440, 640, 655
uoer War	218	Cahill Harry A.	691	114
uogadothir, Vigdis Funn	325	Cairo	317	350
uogota	314	Calcutta	558, 668	627, 653, 675
uokaro	625	Calcutta Chronicle	580	337
uokasa, Jean Bedel	313	Calcutta Gazette	580	214, 653
uolan Pass	392	Calendar introduction of	213	669
uolivia	309	Calpain	201	678
uolshevik revolution	219	Calvena major	138	432, 471
uombay	559, 642	Cambay, gulf of	626	
uombay, bifurcation of	422	Cambrian age	142	227
uombay High Oilwells	423	Cameroon	312	430, 642
uombay Reorganisation Act	644	Canada	312	231
uombay Samachar	580	Canan Banana	358	679
uorn Jesus, Basilica of	680	Canary Is.	362	193
uonannus of Pisa, architect	230	Canberra	306	426, 471
uonded labour	424, 598	Cancer	152, 197, 199, 601	487
uondi, Hermann	67	Cancer, tropic of	626	210
uone-marrow transplant	433	Candela	191	215
uongaigaon Refineries	509	Cannanore, Raja of	681	229
uongo Albert Bernard		Canning, Lord	401	267
(Omar)	320	Cantonment Board	677	677
uonnei, Dr. Karmenu Mifsud	334	Cantonments Act	519	399, 412
uooker prize	372	Cape of Good Hope	345	436
uophuthatswana	302, 345	Cape Town	345	437
		Cape Verde	313	440, 631
uorder roads	553	Capri	327	660
uorlaug Award	376	Caracas	355	398
uose, S.N.	590	Carbon Cycle	135	681
uose, Subhash Chandra	400, 412	Carbon dioxide	141	227, 690
uowell, Johnson	269	Carboniferous age	142	444, 647
uotswana (Bechuanaland)	310	Cardamom	533, 639, 640	728
uourgiba, Habib Ben Ali	351	Car Nicobar	671	681
uoxing	727	Carrol, Lewis	266	638
urahe, Tycho	84, 113	Carson, Johnny	276	660
urahmagin	660	Carter, Jimmy	222	652
urahmani, the	650	Carlyle, Thomas	268	349
urahmaputra	440, 621	Casaroli, Agostino, Cardinal	355	663
urahmarshi Desa	666	Cash, Sir Gerald	307	516
urahms, Johannes	271	Cassidy, Prof. Harold	137	597
urahu	454	Cassini	97	576
urando, Marlon	273	Castries	346	313
urazil	310	Castro, Dr. Fidel	315	650
urazzaville	315	Catacombs at Rome	230	533
urazhnev, Leonid	225	Catal Huyuk	209	122
uridgetown	308	Catering Technology	611	314
urisbane	307	Catskill mountains	122	220
urish East India Co.	682	Caucasian languages	254	216
uronte Charlotte	268	Caucasiod race	146	356
urown, Judi	715	Cauvery	440, 441	141
urown, Michael S.	363	Cavemen	208	682
urunei	310	Cayman Islands	358	233
urussels	308	Chazou, Dr. Yevgeny	362	578
		Ceausescu, Nicolae	342	660
urucharest	342	Cell, the	148, 149, 150	548
uruck, Pearl S.	268	Cellular jail	426, 672, 674	657
rudapest	324	Celsius, Anders	183	151
rud, Zola	716	Celsius scale	183	290
urumbura	311	Census	1981	660
uddha, Gautama	257	Centenary of the Congress	403	398
uddhusts	451	Central African Republic	313	164
udget	487	Central Board of Film Censors	573	271
uenos Aires	306	Central Board of Secondary Education	585	583
uffon, Comte de	113	Central Drugs Laboratory	602	557
ulgana	311	Central electricity authority	506	672
undi	656	Central Employment Exchange	596	214
unyan, John	269	Central Institute of Educational Technology	586	183
urbidge Prof. Geoffrey	206	Central Universities	587	258
urke, Edmunds	270	Cereal cultivation	392	451
urkina Faso (Upper Volta)	311	Ceres	105	123, 358
urma	424	Cerezo, Vinicio	322	149
urmah Shell	630	Cervantes, Mignel de	267	198
urney S.M.H.	273	Chad	313	268
urns, George	81	Chail	632	272, 578
urns, Jack	311	Chaitanya	260	230
urundi	353	Chakroborty, Nripen	436, 664	302, 345
urush, George	399, 623, 668			423
uruxar, battle of	267			458
uryn, Lord				

City States	210	Coon, Carleton S.	146	Dalhousie, Lord	547, 6
Civil Disobedience	399, 400	Cooperatives	532	Dal Khalsa	47
Civilisation, the great	392	Copper, Gary	273	Dalhousie	63
Clark, Barney	225	Coordinated Universal time (UTC)	185	Daman	67
Clarke, Immanuel Innocent	350	Coorg	660	Damanganga, the	62
Classical Writers	263	Copenhagen	316	Damascus	34
Classics	263, 265	Copernican theory	66	Damodar	440, 441
Clive	217, 399	Copernicus	113	Dandi march	41
Clones	155	Copper	243	Dange, S. A.	42
Clouds	129	Copper alloys	212	Dante, A.	28
Coal	248, 508	Copper rings	393	Darbara Singh	427
Coast Guard	518	Copper stone age	210	Dar-es-Salem	392
Cochin	559, 636, 638, 640	Corals, precious	245	Darus	67
Cochin Ginger	534	Corbett, Jim	269	Darjeeling	444, 668
Cochin Refineries Ltd.	509	Cordero, Leon Febres	317	Darwin, Charles	28
Cochin Shipyard	558	Coringar river	686	Dascalescu, Constantin	34
Coconut production	639	Coriolis effect	124	Das C R	400, 41
Cocos (Keeling) Islands	358	Conso	318	Data & Computer	70
Codons	155, 160	Coroibos	714	Daughter theory	10
Coe, Sebastian	715	Coromandel Plain	660	Dawn-lit mountains, land of	67
COFEPOSA, passing of	423	Corporate Sector	524	Dawson, Admiral	42
Coffee production	636	Cosmic year	92	Dayananda Saraswati, Swami	28
Coir Board	529	Cosmology	66	Delussy Claude	27
Coleridge, S.T.	266	Cossiga, Francesco	327	Decibel (db)	45
Coliseum (Colosseum)	230	Costa Rica	315	Decimal system	45
Collins	102	Cotopaxi	122	Decoding DNA code	16
Collins, Larry	267	Cottage industries	527	Defence, Ministry of	51
Colombo	346	Cotton cultivation	393	Defence production	51
Colombo Plan	289	Cotton, Henry	403	Defoe, Daniel	27
Colossus at Rhodes	229	Cotton production	627	Gaulle, Charles	31
Columbia	112	Coubertin, Pierre de	714	Dehra Dun	44
Columbus	327	Council of Europe	290	Demos	9
Combe Cappelle	145	Council of Ministers	459	Delhi	676
Comets	103, 104	Council for Mutual Economic Assistance (COMECON)	291	Delhi Asiad	71
Command Area Development	535	Council of Scientific Industrial Research (CSIR)	591	Delhi Municipal Corporation	67
Commandments, Ten	262	Courtallam	663	Delinking education	58
Commercial Banking	499	Crab nebula	84	Delvalle, Eric Artwro	34
Commissioned ranks	518	Cranganore	681	Democratic Socialist Party	47
Commoner, Prof. Brarry	137	Craxi, Bettino	327	Demographic transition	61
Commonwealth	290	Cretaceous age	143	Demonetisation	49
Commonwealth Games	720	Crick	728	Dempo steamships Ltd	55
Communicable diseases	601	Crick, Francis	153	Denktash, Rauf	31
Communication	562	Cripps Mission	400, 418	Denmark	31
Communication 21st century	703	Cro Magnon	145	Dental Council of India	60
Communication services	708	Cromwell Current	125	Dept. of Atomic Energy (DAE)	59
Communications technology	703	Cromwell, Oliver	217	Dept. of Space (DOS)	591
Communist Party of India	470	Cronds, the	641	Dependencies	30
Comoros, the	314	Crop insurance scheme	628	Deposit Insurance Corporation	49
Companies Act	524	Crops & Seasons	532	Depression, great	21
Composts	251	Crosby, Bing	272	Deputy Ministers	70
Compton, John George Melvin	346	Crude oil production	247	Desai, Bulabhai	41
Comptroller General	460	Crusades	215, 216	Desai, Morari	424, 426, 471
Compulsory Deposit Scheme	423	Cryogenics	182	Descartes	10
Computers	704, 711	Cryosurgery	183	Desert Dev. Programme (DDP)	535, 54
Conakry	322	Cryptozoic age	142	Deserts, great	58
Concorde	235	Ctesabius	184	Deshpande, K.L.	58
Confucianism	258	Ctesiphon, architect	229	Devisi, Sir Baddeley	34
Confucius	258	Cuba	315	Devonian age	14
Congo, the	315	Cultivation, beginning of	143	Dewanagin	61
Congress (I)	471	Cuneiform writing	212	Dewas	64
Congress ministries	400	Cuppy, Will	138	Dhaka (Dacca)	31
Congress Presidents	408, 409	Curren, Kevin	741	Dhansiri	64
Consolidated fund	487	Currency, issue of	213	Dharmasala	64
Constantine, emperor	215	Currency Notes, demonetisation of	400	Dhawan Prof Satish	432, 5
Constellations	86	Curzon, Lord	399, 404, 668	Dholpur	64
Constituent Assembly	456	Cyclones	445	Dhruva Reactor	511, 512
Constitution	456	Cyclone havoc in Orissa	651	Dialects	5
Constitutional monarchy	352	Cygnus X-1	88	Diamonds	5
Constitution Amendments	462, 469	Cyprus	315	Dickens, Charles	2
Constitution, basic features	456	Cynus	213, 262	Diego Garcia	3
Constitution of India	421	Cytoplasm	149	Diesel Locomotive Works	5
Constitution, the preamble of	458	Czechoslovakia	316	Digambaras	2
Continents	116			Digha	7
Continents and oceans, origin of	116			Digital technology	6
Continental drift	116			Dikhu	6
Continental terrace	126			Dinosaurs, end of	1
Contingency fund	487			Diogenes	2
Continuous creation theory	67			Diouf, Abdou	3
Continuum radiation	72			Dirac	2
Contract labour act	598			Directive principles	457, 4
Cooch Behar	668			Direct Telecom Gateways	7
Cooking gas	511			Disasters	7
Cook Islands	361				

D

Dacko, David	313
Da Costa, Manuel Pinto	343
Dada Sahib Phalke Award	374
Dadra	676
Dairy industry	627
Dakar	343
Dalai Lama, flight of	220

Bismac Nagar	675	Educated workseekers	595	Family pension, quantum of	599
Disney, Walt	273	Education, new path for	583	Family planning	278
Dspur	620	Edward VIII, abdication of	219	Family welfare	600
District industries centres	528	Edwards, Robert	161	Farm forestry	542
Du	678	Effluents	141	Farook M.O.H.	690
Dutt Uma Shankar	670	Egli, Alphons	348	Farraka Barrage	423
Dibout	317	Egyptians, the	212, 317	Fast Breeder Test Reactor (FBTR)	511, 1513, 696
Dlamini, Prince Bhikampi	347	Einstein	70, 200	Fatehpur Sikri, foundation of	398
DNA	153	Ekanath	260	Father of the Nation	419
Dobshansky, Theodosius	146, 147	Elara, Prince	661	Fatty acids, essential	164
Dock Labour Boards	559	Elba	327	Faulkner, William	270
Doctrine of Lapse	401	Election Commission	460	Feature Films, certified	575
Doddabetta	660	Election (1985) results	476	Federal Structure	486
Dodo the	138	Election Symbols	470	Fernando Poo	318
Doel Samuel Kanyon	332	Electricity	506	Fertilisers, consumption of	532
Doha	342	Electro-magnetic thesis	70	Fertility rates	452
Domestication of animals	393	Electronic banking	704, 705	Festival of India in Paris	691
Dominica	317	Elementary particle physics	203	Fianna Fail Party	326
Dominican Republic	317	Elements	179	Fiedler, Arthur	271
Dominion Status	220, 414	Elements as part of diet	165, 166	Fielding, Henry	270
Dong, Phan Van	356	Elephanta	645	Fiji	318
Doora	666	Eliot, George	266	Film and Television Institute of India	577
Doordarshan expansion of	567	Eliot T.S.	267	Films, burgeoning numbers	573
Doppler effect (shift)	67	Elizabeth I, Queen	216	Film Festival Awards	375
Dorjei Phu	227	Elizabeth II, Queen	220, 352	Films, production	573
Dostoyevsky Feodor	266	Ellora	645	Finance Act	488
Douglas Leoyd	270	Elobey, Great	318	Finland	319
Dowry Prohibition Act	694	Elphinstone Bioscope Company	578	Finlay prize	371
Doyang	649	El Salvador	318	Fireballs	107
Doyle Arthur Conan	266	Emergency, declaration of	423	Fire in Bombay High	431
Drake Col	509	Emigration act	599	Firewood	249
Drake's Voyage	216	Emmanuel II, Victor	327	Fiscal Policy, new	488, 492
Dravidian Languages	254	Employees' Provident Fund	599	Fisher, Louis	266
Dravidians	259, 446	Employees' State Insurance Act	598, 599	Fitzgerald, Garret	326
Drishavaditi	628	Employees' Stock Option	693	Five-Year Plans (1-6)	494, 496
Drugs control	602	Employment Exchanges	595, 596	Flora Fauna in India	441
Drummond, Michael	235	Employment of women	595, 596	Flora mountains	121
Druze	303	Encke	104	Folkman, Judah	199
Duarte Jose Napoleon	318	Energy	506	Food adulteration	602
Dubey Han Sankar	685	England	352	Food & Agriculture Organisation (FAO)	285
Dublin	326	English	256, 454, 456	Food crops	533
Duby, Bindeshwan	625	English as official language	216	Food & Drugs Administration	602
Dumas Alexander	267	English East India Co.	398	Food and energy	168
Dungarpur	656	English Press	580	Food and nutrition	163
Dunn, L C	147	Enosis	315	Food for Work Programme (FWP)	538, 594
Duplex	686	Environment : Ganga Plan	613	Food values of Indian items	167
Durrani, Ahmed Shah	305	Eocene age	143	Football	731
Dutch East India Co	217	Ephedra	193	Ford, Gerald	221
Dutta, Dr P.C.	208	Epics	259	Foreign Companies	527
Dutt, Aswini Kumar	405	Epicurus	264	Foreign Exchange Regulation Act (FERA)	484
Dutt, B N	405	Equatorial Guinea	318	Foreign trade, India's	504
Dutt Committee	521	Ershad H.M.	224, 308	Forest area	544
Duvalier, Jean Claude	323	Esquivel, Manuel Amadeo	309	Forest Conservation Act	484, 541
Dvraith	260	Essential Commodities Act	504	Forests, death of	140
Dwaraka	260, 627	Estenssoro, Victor Paz	310	Forester, M.M.	265
Dwindling forests of India	543	Ethiopia	318	Fort St. George	399, 663
Dyer, Gen.	411	Ethnology	146	France	319
E		Euodioxous of Cnidos	113	Frances, Gen.	345
Eanes, Gen. Antonio Ramalho	341	Eurelios	252	Fraunhofer lines	93
Ear	77	Euripides	264	French	256
Earth data	114	European Economic Community (EEC)	291	French Community	292
Earth, geological history of	142	European Space Agency	606	French East India Co.	686
Earthgrazers	106	European Space Research Organisation (ESRO)	291	French Revolution	217, 319
Earthquakes	118	Everest, Col. Sir George	233	Freedom & After	421
Earth, rotation of	171	Everest, the	439	Freedom Medal	371
Earth, the	113	Evolution	141	Freetown	344
Easter Island	359	Evren, Gen. Kenan	351	Frigates of the Indian Navy	518
Eastern Coal Ltd	670	Explorer-I	108	Fruit crops	631
Eastern Ghats	440	Extra-terrestrial, the	273	Fujiyama	122
East India Company	217, 661	Eyadema, Gen. Gnassingbe	350	Fuller, Bampfyde	405
Echo-Cardiogram	78	F		Funafuti	351
Economic policy new	485	Fabius, Laurent	228, 319	Fundamental rights	457, 458
Economic & Social Council	283	Facsimile Channels	704	Furnas Project	251
Ecological crisis	136	Faeroe Islands	360	Futehally, Zafar	250
Ecology	136	Fahd, King	343	G	
Eco-system	133	Fahrenheit scale	183	Gabon	320
Ecuador	317	Fakhruddin Ali Ahmed	423, 424	Gaborone	310
Edava	638	Falkland Islands (Malvinas)	359		
Edict of Milan	215	Falklands war	225		
Editors Guild of India	583				
Edler Dr Inge	78				
Edmonton	312				

Cabriel, Archangel	343	Giri V.V.	422, 427	Gulf War	302
Cagarin, Yun	109	Glass, Bently	147	Gulmarg	633
Galactic clusters	82	Glasspole, Florian Augustus	329	Gundar, the	660
Galactic nucleus	82	Globular clusters	82	Gun powder plot	217
Galapagos Is.	360	Glorious Revolution in England	217	Gunther John	268
Galaxies	79, 81	GMT Clocks stopping	184	Gupta dynasty	398, 668
Galaxies, cluster of	80	Goa	422, 678, 679	Gupta emperors	623, 626
Galbraith, J.K.	265	Goa Shipyard	518, 520	Gupta Vishwa Bandhu	583
Galena	209	Goculdas Tejpal Sanskrit College	404	Gurdon J.B.	155
Galilean satellites	97	Godavari, I.N.S.	434	Guru Angad	653
Galileo, Galih	71, 97, 113, 169	Godavari, the	440, 441, 618, 643	Guru Arjun Dev	65
Gallantry Awards	375	Godse, Vinayak N.	421	Guru Har Gobind	65
Galle, Gottfried	99	Godthaale	359	Gurumukhi script	653
Galsworthy, John	268	Goenka Award in Journalism	377	Guru Nanak	398, 653
Gambia, ray	320	Goethe, J. W. Von	267	Gurupadaswamy Committee	597
Gamma ray	70	Gokhale, Gopalakrishna	405, 408	Guru Ram Das	653
Gamma ray astronomy	73	Golconda	618, 620	Guruvayoor	640
Gamow, George	67	Golden Temple	655	Gustav, Carl XVI	347
Gandak	440, 663	Goldstein, Joseph L.	363	Guwahati Refinery	509
Gandhi	220, 399, 421, 437, 479	Gold, Thomas	67	Guyana	323
Gandhian chronology	419	Gomant	679	Gwalior	642
Gandhi Film	432, 577	Gomati, the	440, 665	Gymnastics	734
Gandhi-Irwin Pact	400, 415	Gondi	454		
Gandhi-Longowal Agreement	692	Gondopharnes, King	398	H	
Gandhi, Mrs. Indira	228, 422, 425, 470, 619	Gone with the Wind	273	Habre Hissene	313
Gandhinagar	625	Gonzales, Felipe Marquez	345	Habyarimana Juvenal	343
Gandhi, Rajiv	228, 437	Goodriche, John	83	Hadrian emperor	215
Gandhi, Sanjay	427	Gopakpattan	679	Hafez al-Assad	346
Ganga dynasty	651	Gopalakrishnan, Adoor	374	Hagi Sophia	215
Ganga Project	613	Gopalan A.K.	424	Hahnemann	195
Ganga, the	623, 665	Gopal Singh Dr.	676, 680	Haile Sellassie I	221, 318
Gangas, the	635	Copapuram	679	Hailey, Arthur	266
Ganges	440	Gorbachev Mikhail	282, 296, 282, 296, 355, 690	Haiti	323
Gangotri	440, 667	Gouba	679	Hai	261
Gangtok	657	Govt. of India Act (1919)	411	Halda Refinery	509
Garbage energy	252	Governors of States	460	Halifax	312
Garden Reach Ship Builders & Engineers Ltd (GRSE)	518, 520	Govindan Nair, M.N.	437	Halley's Comet	104, 105
Garga	440	Govind Singh, Guru	263	Halo stars	82
Garos, the	647	Grafting DNA	157	Hamilton	303
Gas leakage at Bhopal	228	Gray, Thomas	267	Hammarskold, Dag	283
Gateway switching system	566	Great Andaman	671	Hammurabi	213
Gayoom, Maumoon Abdul	333	Great Britain	352	Hampi	635
Gauda	668	Great Calcutta Killings	418, 421	Handball	734
Gauhati	622	Great Civilizations, first	210	Handicrafts	529
Gavaskar, Sunil	696	Great Eastern Shipping Co.	557	Hanging Gardens of Babylon	229
Gegong Apang	675	Great Fire of London	217	Hannibal	214
Gelboin, Harry	197	Great Indian Peninsular Railway Co.	547	Hanoi	356
Gell-Mann, Murray	205	Great Nicobar	671	Hanumanthiah, K.	427
Gell-Mann Nishijima relation	204	Great Plague of London	217	Han-yi	193
Gemayel, Amin	331	Great Red Spot	97	Hapsburg dynasty	216
Gemstones	246	Great Wall of China	229	Haptens	152
Gene flow	148	Greece	321	Harappa	392, 394
General Agreement on Tariffs & Trade (GATT)	286	Greene, Hamilton	323	Harare	358
General Assembly	282	Greenland	359	Hardeo Joshi	657
General Election	471	Green Movement	141	Hardwar	667
Genes	153-159	Green Revolution	280, 529	Harjan, publication of	42
Genes, jumping	161	Greenwich Mean Time (GMT)	185	Hardy, Thomas	267
Geneva Summit meeting	296	Gregorian Calendar	216	Harrison, George	272
Genotype	147	Gregory I, Pope	271	Harrison, Gordon	137
Geological Structure of India	438	Grenada	322	Harsha	651
Georgetown	323	Gromyko, Andrei	355	Haryana	422, 627
Geothermal energy	253	Grootfontein	107	Hassan II, King	335
German	256	Gross, Michael	715	Hastinapuri	666
Germany East	320	Grover, Justice A.N.	582	Hastings, Warren	399
Germany West	320	Growing Print Media	579	Hatzfeldt, Herman Graf	140
Ghaddafi, Col. Muamar	332	Growth, a myth or reality?	483	Hauptman, Prof-Herbert A.	365
Chaghara the	665	Growth-highest & lowest	452	Havana	315
Chaggar, the	628, 653	Guadeloupe	360	Hawke, Bob	228, 307
Chana (Gold Coast)	321	Guam	362	Haydalla, Mohammed Khouna Ould	334
Ghataprabha, the	634	Guatemala	322	Hayden planetarium	107
Ghose, B.K.	405	Guayale plant	531	Hazaribagh	625
Ghosh, Arabindo	405, 408	Guinea	322	Hazlitt, William	277
Giacobini-Zinner	105, 107	Guinea-Bissau	322	Head, Edith	27
Gibbon, Edward	267	Gujarat	625	Heads of Important offices	701
Gibraltar	359	Gujarat agitation	477	Health for all	60
Gilada, Dr I.S.	196	Gujarati	455	Heard & McDonald Islands	35
Gingee, the	686	Gulab Singh, Maharaja	632	Heat cycle	13
Ginger, fibreless	685	Gulf Cooperation Council	303	Heavy Water Project	65
Giotto	105, 700	Gulf Stream	124	Hebrew tribe	26
Gir Game Sanctuary	443, 627			Hegde, Ramakrishna	432, 436, 636, 68

elocentric theory	113	Hungary	324	Indira Gandhi Award	377
elium	182	Huq, Fazlul	412	Indira Gandhi Canal	655
elsunk	319	Hurricanes	133	Indira Gandhi National Open	
emavati, the	634	Husak, Gustav	316	University	588
emingway, Ernst	265	Hussain, Dr. Zakir	422	Indira Point	671
emkund	667	Hussein, King	329	Indo-Anglian writers	268
epburn, Miss Katherine	273	Hussein, Saddam	302	Indo-Aryan languages	433
eredity	154	Huxley, Aldous	266	Indo-European languages	254
erodotus	264	Hwan, Chun Du	331	Indonesia	325
erschel, William	66, 68, 99	Hydel power	251	Indo-Pakistan war	422
ertz, Heinrich	70	Hyderabad	618, 620	Indo-soviet joint manned	
erzog, Chaim	327	Hyder Ali	635	mission	608
ickey, J. A.	580	Hydro resources	509	Indravati, the	640
gh Courts	460	Hydrosphere	115, 123	indus, the	440, 653
gher education	591	Hyksos, the	212	Indus civilization	210
gher numerals	186			Indus seals	395
illary conquers Everest	220			Indus (valley) civilisation	392
illery, Patrick John	326	I		Industrial cooperatives, national	
ill, Rowland	218	Ibsen	265	federation of	528
umachal Pradesh	630	Iceland	324	Industrial Development Bank of	
umalayas	121, 439	Idul Fiter	261	India (IDBI)	498
unayana	257	I.I.T. Student strength	588	Industrial Disputes Act	598
undi	455, 456	Ilbert bill	402	Industrial growth	484
induism	258	IMF loan (SDR) to India	429	Industrial growth rate	522
indu-Muslim faction	400, 407	Imperial Bank	497, 499, 500	Industrial licenses	523
indus	451	Imperial system	187	Industrial policy liberalisation	521
Industan Aeronautics Ltd.		Imphal	645	Industrial revolution	139
(HAL)	520, 636	Implements, making of		Industrial strides	520
Industan Machine Tools	636	sophisticated	210	Industries, development of	210
Industan Petroleum Corpora-		Imports & Exports	505	Information Network System (INS)	704
tion Ltd.	509, 510	Income tax rates	488	Infrared Astronomical satellites	
Industan Samachar	582	India, a republic	220	(IRAS)	206
Industan Shipyard Ltd.	558	Indian Airlines	560	Infra red astronomy	73
indu, the	581	India: Basic Data	617	Infra red rays	69
ngsen, Jurgen	715	Indian Council of Agricultural		Inland trade, India's	504
pparchus	84	Research (ICAR)	591	Inland Water Transport	
ppocrates	193	Indian Council of Medical		Corporation	555
rohits, Emperor	329	Research (ICMR)	591	Inner Planets	94
roshuma	300	Indian Dairy Corporation (IDC)	545	Inquisition, the	679
spaniola	317, 323	Indian & Eastern Newspaper		INSAT	430, 568, 585, 607
ttler, rise of	219	Society (IENS)	582	INS Vikrant	517
ettes, the	212	Indian Electricity Act	506	Institute of Aviation Medicine	519
ars, the	684	Indian Express	581	Integral Coach Factory	548, 550
are, Sir Samuel	415	Indian Farmers Fertilisers		Integrated Digital Network IDN	566
obart	307	Corporation Ltd. (IFFCO)	532	Integrated Rural Development	
ockett, Charles F.	144, 145	Indian Federation of Working		Programme (IRDPI)	535, 594
ockey	735	Journalists (IFWJ)	583	Integrated Services Digital	
ogenakkal	663	Indian Independence Act	419	Network (ISDN)	704
ojatoleslam Ali Khamenei,		Indian independence, first war of	217	interest Tax Act	498
Ayatollah	325	Indian Institute of Indology	687	Interferon	158
okkaido	329	Indian Institutes of		International Air Transport	
olani	454	Management	588	Association	292
olling, Dr.	137	Indian Institute of Science	591	International Atomic Energy	
olmes, Prof. Arthur	114, 117	Indian Institute of Technology	588	Agency (IAEA)	284
olocene age	143	Indian Languages Newspapers'		International Bank for Reconstruction	
omeopathy	195	Association (ILNA)	583	& Development (IBRD)	285
omer	264	Indian National Army	400	International Bureau of Weights	
ominidae	144	Indian National Congress	399, 469, 470	and Measures	187
omo sapiens	145	Indian National Science Academy	591	International Civil Aviation	
onduras	323	Indian Oil Corporation Ltd.	510	Organisation (ICAO)	285
onecker, Erick	320	Indian Railway, First	399	International Court	283
ong Kong	323	Indian Red Cross Society	601	International Date Line	185
onara	344	Indian Remote Sensing Satellite		International Development	
onshu	329	(IRS)	608	Association (IDA)	285
oghly, the	668	Indian Science (1985)	696	International Events (1985)	697
oks, Valerie Brisco	715	Indian Science Congress		International Finance	
ope, Anthony	269	Association	591	Corporation (IFC)	285
orace	264	Indian Shipping orange	556	International Fund for Agricultural	
oshangabad	642	Indian Space Programme	607	Development (IFAD)	286
smi Mubarak, Egypt's President	224	Indian Space Research		International Hotspots	301
stel management	610, 611	Organisation (ISRO)	605	International Labour	
uphouet Boigney, Felix	327	Indian systems of Medicine	603	Organisation (ILO)	284
ow a rupee comes & goes	486	Indian Telephone Industries	636	International Maritime	
yle Fred	67	Indian Tourism Development		Organisation (IMO)	286
yo, Jose Azcona	323	Corporation (ITDC)	612	International Monetary Fund	
ysalas of Dwarasamudra	635	India's Aid to the USA	691	(IMF)	285
ubble Edwin P	66	India's climate & rainfall	443	International Olympic Committee	
rdson, Rock	195	India's first spaceman	227	(IOC)	714
go, Victor	268	India Gazette	580	International Rice Research	
man revolution	144	India Steamship Co. Ltd.	557	Institute (IRRI)	530
mboldt current	124	India & The States	391	International Telecommunication	
me Allen Octavian	403	India Today	581	Union (ITV)	286
ndred Years' War	216	Indira Gandhi Atomic Research	511	International Units	187, 190
		Centre			

Inter-state Transport Commission	554	Jessops	550	Kapoor, H.L.	678, 679
Inventions	176	Jesus Christ	258	Kapurthala	655
In vitro fertilisation	162	Jet streams	130, 131, 132	Karaisal	686
Ionosphere	130	Jensen, Oliver	92	Karala	645
Iqbal, Zafar	715	Jhalawar	656	Karami, Rashid	331
Iran (Persia)	325	Jhansi	649	Karauli	656
Irani, Ardeshir	578	Jhelum	440	Kanba dam	251
Iraq	326	Jhumming	648, 650, 675, 685	Karnaphuli, the	684
Ireland (Eire)	326	Jinnah, M.A.	410, 417, 421, 422	Karnataka	633
Irian Jaya	325	Jnanpith Award	372	Karle, Prof. Jerome	363
Irulars	446	Jobless doctors & engineers	599	Karmal, Babrak	305
Irwin, Lord	400, 415	Jodhpur	686	Karmamarga	260
Ise	262	Johannsen, Wilhelm	153	Karunakaran Ministry	429, 640
Islam	261	John, Elton	272	Karunamudhi, M.	433
Islam, rise of	215	John Paul II, Pope	328, 355	Kasauli	63
Islamabad	339	Johore, straits of	333	Kashmir handicrafts	633
Islamic calendar	261	Joint Stock banking	499	Kashmir	455
Islands	122	Jones, T.J.	100	Kasturba, death of	421
Islands, largest	123	Jordan	329	Kastun, G.	583
Isle of Man	352	Josef, Prince Franz	332	Katanga copper mines	357
Isotopes	180	Joshi, Kummud Ben	620	Katchal Is.	672
Israel	213, 220, 224, 262, 326	Journalism, periodical	581	Kathmandu	337
ISRO satellite centre	605, 606	Joyce, James	271	Katnamkulam	638
Itafor	675	Juan Carlos, King	345	Katre, L.M.	436
Italian invasion of Ethiopia	219	Juan Fernandez	359	Kaunda, Kenneth David	357
Italy	327	Judaism	262	Kauravas, the	628
Itanagar	674	Juganhar	581	Kautilya (Chanakya)	264
Ithasas	259	Jugnauth, Aneerood	334	Kavalur	75
Ivory Coast	327	Julian calendar	214	Kavaratti	680, 681
Iyengar, Ramaswamy	413	Julius Caesar	214	Kaveri, the	634, 660
Iyer, Sivaswamy	412	Juma Masjid	678	Kayamkulam	638
		Juma prayer	261	Keats, John	268
		Junction network	709	Keck telescope	75
Jabalpur	642	Junior Red Cross	602	Kedarnath	667
Jackburns, Dr.	68	Jupiter	97	Keechaka Vadhom	578
Jacobs, Sir Wilfred Ebenezer	306	Jurassic age	143	Keibul Lamjao	647
Jagannatha temple	651	Justinian, emperor	215	Kekchis	309
Jagjivan Ram	409, 471	Juvenal	264	Kelkar	413
Jagmohan	633			Kelvin scale	183
Jaguar aircraft	430			Kendrya Vidyalayas	587
Jai Chand	677			Kengoda	651
Jainism	261			Kengo Wa Dondo	357
Jainism & Buddhism	397			Kennedy, J.F., assassinated	220
Jains	451			Kenya	330
Jaintia hills	622			Kepler, Johannes	84, 113
Jaintias, the	647			Kerala	636, 638
Jaipur	655, 656			Kerala Girls' enrolment	592
Jaisalmer	656			Kerala highest & lowest	636
Jakarta (Batavia)	325			Kerala Seesaw politics	638
Jakher, Balram	427			Keshavananda Bharati case	456
Jaldhaka, the	668			Khaddar	413
Jallianwallabagh	219, 399, 411			Khadi & Village Industries Commission (KVIC)	507, 525
Jalpaiguri	668			Khajuraho	642
Jamaica	327			Khalifah bin Hamad al Thani	342
Jamir S.C.	650			Khalistan	478
Jammu & Kashmir	632			Khalisa, the	267
Jamshedpur	625			Khampti	674
Jamuna	440			Khan, Abdul Ghaffar	418
Janata Party	424, 427, 469, 470			Khaparde	405
Janata (S)	471			Kharavela	65
Janata's industrial policy	521			Kharg	30
Jansky, Karl	71, 72			Kharboli	45
Jantar Mantar	678			Kharif	53
Japan	329			Khartown	34
Japanese Air crash	380			Khasis, the	64
Jarawas, the	673			Khulafat movement	399, 41
Jarrige, Jean Francoise	392			Khulji dynasty	35
Jaruzelski, Wozciech	341			Khurana, S.L.	6
Jastrow, Dr. Robert	386			Khyber pass	3
Java	325			Kibbutzim	3
Java man	208			Kidwai, Dr. A.R.	6

Knorozou, Prof	211	Lala Lajput Rai	408	Lothal	392, 627
Kodagu	454	Lal Bahadur Shastri Nautical & Engineering College	558	Louise Joy Brown	161
Kodaikanal	660	Laldenga	437	Lown, Dr. Bernard	362
Kodars	446	Lalla	260	Luanda	306
Kodungalore	638	Lal, Prof. B.B.	394	Lucknow	664, 667
Kohima	649	Lalthanhawala, M	685	Lumbini	257
Kohinoor	246, 620	Lamb, Charles	267	Lumiere Brothers	578
Kohl, Helmut	225, 321	Lamrani, Mohammed Karim	335	Luna-3	108
Kohoutek, Dr Lubos	104	Land Fall Island	671	Luna-16	102
Koivisto Mauno	224, 319	Landmarks of history	397	Lunar calendar	213
Kollinglea Gen. Andre	313	Land reforms	538	Lunar module	109
Koiodine the	684	Land surface	115	Luni, the	655
Kols the	641	Language families	254	Lunokhod's landing on Moon	22
Kona Prabhakar Rao	645	Language Press	580	Lunokhod-1	102
Konarak	651, 663	Languages	253, 255	Lusaka	357
Konda	454	Languages of India	453, 455, 456	Lushai Hill Dt.	684
Konkan Passenger service	556	Lanka Dahanam	578	Lushais, the	684
Konkan, the	642	Lao-tse	258, 263	Lusnchi, Jaime	356
Konyaks, the	649	Laos	331	Lutzelburg	332
Koraput	652	La Paz	309	Luxembourg	332
Kora, Thomas	565	Laplace, Marquis de	114	Luzon	341
Korba Aluminium plant	642	Lascaux, cave of	208	Lysine	166
Korea (South)	330	Lasers	200, 202	Lytton E.G.	269
Korea (North)	330	Laski, Harold J.	267	Lytton, Lord	402
Korkens, the	641	Las Palmas	362		
Korou	606	Lata Mangeshkar Puraskar	377		
Kosala	651, 666	Laternan treaty	328		
Kosi	440	Lawrence, D.H.	266		
Kota	454, 656	Lead	209		
Kothan, Dr D.C.	584	Lead Banks	502		
Kountche, Ma. Gen. Seyni	338	Leafy vegetables	167		
Kovalam	640	League of Nations	219		
Kowloon peninsula	323	Leaning Tower of Pisa	230		
Koya, C.H. Mohammed	434	Lebanon	331		
Koyali Refinery	509, 627	Lebanon's civil strife	303		
Koyas	681	Lebedev, Valentin	234		
Krakatoa	120, 377	Le Corbusier	655, 675		
Kripalani, Mrs. S.	423	Lee Kuan Yew	344		
Krishna	440, 441, 440, 618, 634, 643	Lehrman, R.L.	146		
Krishnai the	647	Lemaitre, Abbe Georges	67		
Krishna, M.R.	555	Lemon Grass Oil	639		
Krishnaraja Sagar Dam	636	Lenin Peace Prize	371		
Krishna Rao, Gen.	647, 650, 664	Lennon, John Ono	272		
Kuala Lumpur	333	Lepchas, the	659		
Kudremukh Project	427, 635	Lesotho	331		
Kufri	632	Lewis, Carl	715		
Kun	454	Liberia	332		
Kulus	649, 684	Libreville	320		
Kulkarni, Shrinivas	88	Libya	332		
Kulu	632	Licongwe	333		
Kumbakonam	663	Liebnitz mountains	101		
Kung Fu Tsu	258	Liechtenstein	332		
Kupper Airborne observatory	99	Lie, Trygve	283		
Kupli	647	Life Insurance, nationalisation	422		
Kuran, Dr V	546	Life process	134		
Kurnool	618	Lightning	129		
Kuroshio current	124	Lignite	248, 508		
Kurukh	454	Lima	340		
Kurukshetra	628	Lincoln, Abraham	217		
Kurumbas	446	Lindburgh's flight	219		
Kushans, the	653	Lirni, Walter Hadye	355		
Kushinagar	667	Lippershey, Hans	71		
Kushnagara	258	Lisbon	341		
Kutch. Ranns of	625	Literacy	450		
Kwai	331	Lithosphere	115		
Kwajalein	123	Little Andaman	671		
Kyllang Rock	649	Little Nocoar	672		
Kyprianou, Spiros	316	Li Niannan	226, 314		
Kushu	329	Lloyd, Chris	741		
		Lockyer, Sir Norman	182		
		Lodi dynasty	398		
		Lok Dal	471		
		Lok Sabha	459		
		Loktak lake	647		
		Lorne	350		
		London	352		
		Longowol, Harchand Singh	434, 478, 480		
		Looking Back on 1985	688		
		Loom, invention of	210		
		Los Angeles Olympic Games	714		
		Losonezi, Pal	324		

Malayalam telecasts	688	Mehrgarh	210,392	Monte Carlo	335
Malaysia	333	Mehta, Asoka	437	Montevideo	355
Malayo-Polynesian languages	254	Mehta, Phirozshah	407,408	Montford Reforms	411
Maldives	333	Meiji, Emperor	329	Montserrat	335
Mali	334	Melachens	681	Moon, the	101
Malinitan	675	Melbourne	307	Moor Market fire	691
Malmis	681	Membership, religious	262	Moplah Rebellion	413
Malta	334	Memory enzyme	201	Moraes, Frank	271
Malthusian theory	278	Memory, fastest	171	Moratorium on banks	690
Malto	454	Medel, Gregor	153	Morley Minto Reforms	410
Mamallapuram	663	Menon, K.P.S.	269,426,431	Mormugao	559
Mammals	144	Menon, Prof.M.G.K.	373,688	Morocco	33
Managua	338	Merchant Banking	499	Moroni	31
Manama	307	Mercury	94	Moscow	353
Mancheswar	652	Mesolithic age	209	Moses	213,262
Mandela, Nelson	302	Mesosphere	130	Moses, Edwin	715
Man, descent of	144	Mesozoic era	142	Moshoeshoe, Kung	332
Manila	340	Messenger RNA	154	Mother Teresa University	227,434
Manipur	645	Messink & Reed	580	Mother tongues & speakers	454
Manmohan Singh, Dr.	593	Messner, Zbigniew	341	Motilal Vohra	642
Manned missions	109	Meteoroids	107	Mouthout, Henn	231
Man on the moon	101,221	Metre	190	Moulton, F.R.	114
Manu	264	Metric system	187,422	Mount Abu	657
Mao-Tse-Tung	220	Metric weight & measures	188	Mountains	121
Maputo	336	Mexico	334	Mountains in India	438
Maras, the	684	Meyar, the	660	Mountbatten, Lord	418,422
Marathi	455	Micrometeorites	108	Mount Harnet	674
Marathwada	643	Micro Nutrients	165	Mozambique	336
Marconi	274	Middle stone age	209	Mozart, Wolfgang	271
Marco Polo	398	Midterm elections	474	Mubarak, Hosni	318
Marcos, Ferdinand	341	Midway Islands	362	Mudumalai sanctuary	663
Marcus Aurelius	215	Miladunnabi	261	Mugabe, Robert G	224,358
Marie, Aurelius	317	Milky way	66,80-82	Mughal empire	216,398
Marmagao	680	Milton, John	269	Mughal Gardens	678
Maronites	303	Mundanao	341	Muhamud Ghori	677
Mars	95,96,108	Minerals, major	243	Muhammed, Prophet	261
Marsden, Dr Brian G.	100	Minerals production	625	Muharram	261
Marshak, Robert Eugene	204	Minerva Mills case	456	Mukherjee, Dr Subhas	163
Marshall, Bob	727	Minucoy	681	Mulla question	423
Martens, Dr. Wilfried	308	Minimum Wages Act	598	Muller, H.J	154
Matheran	645	Minto, Lord	405	Muir-rooney, Brian	228,313
Mathias, Bob	715	Minto-Morley Reforms	399	Mumtaz Mahal	230,399
Martinique	360	Miocene age	143	Munda languages	254,446
Maruti Udyog Ltd	523	Mirabai	260	Munich agreement	219
Marx, Karl	267	Mira Behn	431	Munroa	141
Maseru	331	Mir Jafar	399,668	Muscat	335
Mastery of numbers	395	Mir Kasim	399,668	Muslim conquests	215
Masulipatnam	686	MISA bill, passing of	423	Muslim era	261
Maternal & Child Health	605	Mishmi	674	Muslim League	399,403
Maternity & Child Welfare	602	Mishra Dhatu Nigam Ltd.	520	Muslims	451
Mathew, Justice K.K.	582	Missing ships	381	Mussolini, Benito	219,327
Mathew K.M.	583	Miss International	371	Mussoorie	661
Mathews, Paul	205	Miss World	371	Mutation	147
Mathura Oil Refinery	433,509	Mitterrand, Francois	319	Mutiny by Indian Navy Ratings	44
Matsya Union	656	Mixed economy	520	Mutiny by Indian troops	673
Matthews, Thomas	89	Mizo National Front	481	Mwinyi, Ali Hassan	345
Maugham, Somerset	269	Mizoram	621,622,684	Mycenae	213
Mauritania	334	Mizos, the	684	Mycenaeen civilization	213
Mauritius	334	Mobutu Sese Seko	357	Myntang	641
Mauryan dynasty	398,618,623,626,679	Modigliani, Franco	363	Myntdu	641
Mauryan empire	618,635,644,668	Mogadishu	345	Myrdal Mrs Gunnar	42
Maxwell, James Clerk	70	Mogul Line Ltd	556	Mysore	63
Mayan civilization	139,322	Mohammedan era	215	Mzali, Mohammed	35
Mayotte	360	Mohenjo-daro	392		
Mayurakshi, the	668	Mohini Bhasmasur	578		
Myabane	347	Moh's Scale	246		
Mbasogo, Theodoro Obiang	318	Moje	191		
McCartney, James Paul	272	Molecular biology	148		
Meadow, Richard H	392	Momoh, Joseph Saidu	344		
Medals table in '84 games	714	Monaco	335		
Medical Council of India	603	Mangolia	335		
Medicine, Egyptian system	193	Monopolies & Restrictive Trade			
Medicine, milestones of	193	Practice Act	521		
Medicine, modern	194	Monrovia	332		
Medina	343	Monsoon	132		
Medvedev, Nikolai	378	Montague-Chelmsford			
Meghalaya	621,622,647	Reforms	399		

N

Nadia	66
Nadir Shah	399,65
Nagaland	621,622,64
Nagar Haveli	67
Nagavali the	61
Nagore	66
Nagoya	32
Nahan	62
Naidu, Mrs Sarojini	26
Naiki	41
Nainital	61

Naipaul, V.S.	266	Natwar Singh	445	North Atlantic Treaty	
Nairobi	330	Nauru	337	Organisation (NATO)	292
Nair, Sir C Sankaran	414	Naval Academy at Ezhumala	430	North Eastern Hill University	587
Nakasone, Yasuhiro	225, 329	Navaratilova, Martina	741	North East frontier Agency,	
Nalandia	625	Navy	516	(NEFA)	621, 674
Nalinmo Mundia	357	Nayanar government	427, 429	Norway	338
Nal Sarovar bird sanctuary	627	Nayanars, the	661	Novae & supernovae	83
Namadeva	260	Neanderthals	145	Noyll, the	660
Namcha Burwa	621	Nebuchadnessar	262	Nuclear fusion	86
Namibia	336	Nebular hypothesis	114	Nuclear power	509
Namrupa	623	Neemuch	642	Nular, the	686
Nanak, Guru	263	Nefretiti, Queen	193	Numerals	186
Nancoune Is.	672	Negroid race	146	Nurmi, Paavo	715
Nanda dynasty	398	Nehru Award, Jawaharlal	370	Nutrient values	161
Nandalar, the	686	Nehru, B.K.	627	Neyveli Lignite Corporation	508
Naoroji, Dadabhai	407	Nehru, Jawaharlal	220, 266, 294, 400, 420	O	
Napoleon Bonaparte	217	Nehru Literacy Award	376	Oak Tasar industry	647
Narain, Jayaprakash	423, 426	Nehru Memorial Museum	678	Oberoi Lt. Gen. T.S.	674
Narakasur, King	622	Nehru, Motilal	400, 412	Obesity	168
Narasimha Dev	651	Nehru trophy	727	Obote, Milton	351
Narayan, R. K.	267	Nellie Massacre	481	Oceans, the	125
Narayan, K. R.	693	Nelson, Jerry	74	O' Dayer, Michael	411
Narayana Pillai, C.	431	Neo-classicism	265	Official language	460
Narendanath Datta	261	Neolithic age	208, 209, 212	Official secrets Act	580
Narmada	440, 441, 625, 640	Nepal	337	Oil, Coal & Firewood	246
Narora	514	Nepanagar	642	Oil & Natural Gas Commission	
Nartuang	649	Neptune	99	(ONGC)	509
Nashuk	645	Netherlands	337	Oil Production	622
Nassau	307	Netravati	440, 441, 634	Oil, world production	248
Nasser, Col.	295	Net Reproduction Rate	604	Okello, Tito	351
Natal	345	Neutron stars	87	Olav, King	339
Natalie Jane	162	Nevado Ruiz eruption	377	Oldham, R.D.	118
National Aeronautical Laboratory	636	New Caledonia	360	Old Stone Age	208
National animal	442	New Delhi	677	Oligocene age	143
National Anthem	397	New International Economic		Olympics	714, 716, 717, 737
National Bank of Agriculture &		order (NIEO)	282	Oman	339
Rural Development (NABARD)	537	New Mangalore	559	Onassis, Aristotle	321
National Bird	443	New Providence	307	Oncogenes	197
National Cadet Corps (NCC)	516	News Agencies	582	Ongua, Moses Katiji	336
National Calendar	397	Newspapers, Daily	275	Ootacamund	660
National council of Educational		Newspapers, language	581	Open School	586
R & T (NCERT)	586	Newsprint	581, 642	Operation Barga	670
National Dairy Development Board	546	New Stone Age	209	Operation Blue Star	435, 479
National Defence Academy	519	Newton, Issac	71, 109, 113	Operation Flood	426, 545
National Filania Control		New Zealand	337	Ophthalmic treatment	601
Programme	601	Neyyar dam	640	Opposition leader	469
National Film Archive of		Nguesso, Denis Sassou	315	Optical Equivalence Theorem	205
India (NFAI)	577	Nhava Sheva	559	Oraons, the	641
National Film Awards	374	Niamay	338	Ordovician age	142
National Film Development		Nicaea, council of	215	Organisation for Economic Co-	
Corporation (NFDC)	576	Nicaragua	338	operation & Development	249, 292
National Flag	396	Nicobarese, the	673	Organisation of African Unity	
National Highways	551, 553	Nicobar group of Islands	671	(OAU)	292
National Insignia	396	Nicosia	315	Organisation of American States	
National Institute of Rural		Niger	338	(OAS)	292
Development	540	Nigeria	338	Organisation of Petroleum	
Nationalisation of Banks	427, 500	Nijalingappa, S	470	Exporting Countries	
National Leprosy Eradication		Nikholsen, P	100	(OPEC)	248, 293
Programme	601	Nile, the	126	Orion Molecular Complex	80
National Milk Grid	545	Nilgns, the	660	Orissa	650
National Movement	400	Nirankars	452	Orniya	455
National New Technology		Nirmahal	664	Ortega, Daniel Saavedra	338
Telescope (NNTT)	75	Nirvana	257	Orwell George	266
National Per capita income	482	Nishi	674	Osaka	329
National Remote Sensing		Nitai the	647	Osborne Dr J.A	335
Agency (NRSA)	606	Nitrogen cycle	135	Ottawa	312
National Rural Employment		Nitrogen, fixation of	135	Oslo	338
Programme (NREP)	535, 594	Nitz, Paul	389	Ouagadougou	311
National & State Parties	469	Niue	361	Orth	666
National Union of Journalists	583	Nix Olympica	96	Overbite	147
Natter the	586	Nixon resignation of	221	Ovid	265
Natural selection	142	Nizam Shahi dynasty	398, 421	Owambos the	336
Nature, conquest of	137	Nobel Alfred Bernhard	363	Owens Jessie	415
Nature, exploitation of	137	Nobel Prize Winners	364	Oxygen cycle	25
		Nohsingthang waterfalls	647	Ozal Tarni	25
		Noise pollution	78	Ozone layer	130
		Nokrek	647		
		Non Aligned Movement	294	P	
		Non-conventional energy	507	Pacts & Conferences	413
		Non-cooperation movement	412, 420	Padmanabhaiah Palace	640
		Non-formal education	585	Padakone, Prakash	427
		Nordic Aryans	446	Painted wares	393

Ranjit trophy	730	Guarantee Programme	535,594	Semito-Hamitic languages	254
Ranjit Singh	632	Rural poverty	535	Sena dynasty	668
Rao, Prof. U.R.	437	Russo-Japanese war	218,329	Seneca	265
Rao Vandana	715	Russo-US Summit meetings	299	Senegal	343
Rashid bin said al-Muktoun, Sheik	352	Rutherford	70	Sen, Justice A.N.	582
Rashtrapathi Bhavan	678	Rwanda	342	Sen, Mnnal	578
Ratuaban Shipping Co. Ltd	557	Ryswick, treaty of	686	Seoul	330
Ravi, the	440,631,653			Seoul Asiad	749
Rawal, J.J.	100	S		Seoul Olympics	714
Rawlings, F.Lt. Jerry	321	Sabarimala	640	Separation of powers	459
Rayalaseema	619	Sabarmati Ashram	414,627	Sepoy Mutiny	401
Ray, Satyajit	374	Sadam Hussein Tikrite	326	Sericulture	685
Reagan, Ronald	223,269,353	Sabroom, battle of	632	Seringapatam, battle of	682
Recognition molecules	151	SAF games	721	Seringapatam, treaty of	399
Recombinant DNA	157	Sahitya Akademi Award	373	Seventh Plan	492
Reddi, Sanjiva	424,425	Sahrawi Arab Democratic Republic (SADR)	336	Sex ratio	449
Red Fort	678	Seigal, Omesh	684	Seychelles	344
Red Giants	83,92	Saikia, Hiteswar	481	Shah, G.M.	228,436,633
Refinense & Capacities	510	Saiko, Brig. T	481	Shah, Jehan	230,399
Refractor telescopes	71	Saivautes	260	Shah, Neseeruddin	374
Regional Cancer Centres	601	Saka & Gregorian calenders	397	Shakespeare, William	266
Regional Colleges of Education	586	Salinity	139	Shakuntala Devi, Mrs.	232
Regional & State electricity boards	506	Salt Satyagraha	400	Shanti Vana	678
Registrar of Newspapers	579	Salyut	108	Sharavati	440,441,634
Relativity, theory of	88	Samachar Bharati	582	SHAR Centre	605
Religions	257	Sama Veda	258	Sharma, Rakesh	109,434,435
Religious communities	451	Samudragupta	651	Sharma, Shankar Dayal	655
René, France Albert	344	Sana'a	356	Shastri, Lal Bahadur	422
Renewable energy	250	Sandage, Dr. Alan	68,89	Shaw, George Bernad	266
Reorientation of medical education	601,602	Sangeet Natak Awards	374	Shelly, P.B.	265
Repression & Reform	409	Sangma, Capt. William	649	Sherlok Holmes	273
Republic Day Honours	373	Sanguinetta, Julio Mario	355	Sher Shah	623
Research in India	590,591	Sanjay Award	377	Shia Amal Movement	303
Reservation system	477	San Jos	315	Shifting of capital to Delhi	399
Reserve Bank	497,498	Sankaracharya	260	Shillong	622,647
Residual mountains	122	Sankara Kurup, G	269	Shimla Agreement	632
Residuary powers	458	San Marino	343	Shintoism	262
Reunion	361	San Salvador	318	Shipping, Indian	555
Revenue & Capital budget	488	Sanskrit	453,455	Shiyaji	644
Revolt by Sikh soldiers	479	Santiniketan	670	Shop floor ethos outdated	521
Raza, Mohammed	325	Santosh Trophy	732	Shwe Dagon	231
Re-factor	156	Sao Paulo	310	Sicily	327
Rhodesian man	208	Sao Tome & Principe	343	Siderolities	107
Ride, Sally	109,112	Sapru, Sir Tej Bahadur	414	Sierra Leone	344
Ribosome	151	Sara lake	650	Sikhism	263,653
Richter, C.F.	119,380	Saranath	666	Sikhs	399,451
Right Livelihood Awards	376	Saraswathi, the	626	Sikkim	423,657
Rigveda	258	Sardinia	327	Silent Valley Project	434,435
Ripon, Lord	402	Sarkaria commission	432,479	Silurian age	142
Rishang Keeshing	647	Sasanka, King	651	Silva, Antonio Cavaco	342
Ritter, Johann	69	Sasaram	625	Silvassa	676
Rivers	126,127	Sastri, Srinivasa	412	Simla	444
River system in India	440	Satavahanas, the	398,635,679	Simon, Claude	364
Riyadh	343	Satellite Communication era	710	Simon, Commission	400,414
NA	154	Satellite Instructional Television Experiment Project (SITE)	606	Sinai, mount	262
Roads and waterways	551	Satellite media	708	Sindhi	455
Roads in Rural India	539	Sati, prohibition of	399	Sindhu, the	392,653
Road Transport Corporation Act	553	Saturn	98	Singapore	344
Robinson Crusoe island	359	Satyavan Savitry	578	Singh, V.P.	690
Rocky Substructure	116	Saudi Arabia	343	Sino-Tibetan languages	254
Rohini rockets	426,427,606	Scheduled castes	451	Sinowatz, Fred	307
Rolland, Romain	268	Scheduled & non-scheduled banks	498	Sister theory	101
Rolling stock	550	Schedules to Constitution	461	Sivasankara Pillai, Thakazhi	267,372
Rolls, Charles	171	Scheduled tribes	451,641,674	Skylab	108,110
Rolls-Royce car	171	School enrolment	584	Slavery, abolition of	217
Romania	342	Schubert, Franz	271	SLV-3	606
Roman script for Mizo language	685	Schumann, Robert	271	Small Scale Sector	527
Rome	327	Schwarzchild, Karl	88	Smith, Adam	270
Ropar	655	Science, landmarks of	169	Sobriquets	236
Rseau	317	Scotland	352	Socialist pattern	422,520
Round Table		Scotland of The East	647	Sofia	311
Conference	400,414,415,416	Scott, Sir Walter	268	Solanki, Mulraj	626
Rurkela Steel Plant	652	Sears Tower	234	Solar energy	250,251,507
Rwilt Act	411	Seas, Seven	125	Solar system-Planets	90,91
Ry, B.C. National Award	603	Secretariat, U.N.	283	Solatum for motor accidents	554
Rubber production	639,640	Security Council	283	Soliaus, Josef Pintat	306
Rubber tree, new	531	Self-employment	522	Soloman	208
Rudolf, Wilma	715	Sema, Hokishe	632	Solomon islands	344
Rupree rise and fall	496	Semas, the	649		
Rural employment	538				
Rural health	605				
Rural Landless Employment					

[illegible]

Washington D.C.	362	Willoch, Karre	39	Yuksam	689
Washington, George	217	Wimbledon winners	741	Yamuna	631, 665
Waste, dumping of	139	Wind belts	130	Yamunotri	667
Water as part of diet	166	Windhock	336	Yanam	686
Water cycle	136	Windows on space	71	Yandabo, the treaty of	622
Waterfalls, famous	128	Wind power	252	Yaounde	312
Waterloo, battle of	217	Wingti, Palas	340	Year of Accords	477
Water, oceanic	124	Winnipeg	312	Year of air disasters	379
Water resources, fresh	124	Wodehouse, P.G.	270	Yemen (North)	356
Waterways	555	Wodeyar dynasty	635	Yemen (South)	356
Watson, J.D.	153	Wolf, Franz Joseph	106	Yeravada prison	420
Wavell, Lord	400, 418	Wonders of the world	228	Yercaud	663
Weather, regulators of	131	Woodward, Bob	267	Yokohama	328
Weber, Dr. Joseph	83	Word processors	705	Youde, Sir Eduard	324
Wee Kim Wee	344	Wordsworth, William	269	Young India	420
Wegener, Alfred	116	Workers' participation in management	599	Young, Thomas	69
Weightlifting	745	Workmens compesation act	598, 599	Youth Hostels	611
Weights & Measures, conversion tables	189	World Bank	285	Yugoslavia	357
Weismann	158	World of council of churches	294	Yunis, Jorge	196
Weizacher, von	114	World Food Programme (WEP)	546	Yupit nation'	324
Weizsaecker, Richard Von	321, 227, 321	World Health Organisation (WHO)	285		
Wellesley, Marquis of	399	World Intellectual Property Organisation (WIPO)	286	Zaid bin Sultan al Nahayan, Shei	352
Wellesley, Sir Arthur	339	World Media Award	372	Zail Singh becomes President	431
Wellington	337	World of Science (1985)	700	Zaire	357
Wells, H.G.	268	World organisations	289	Zakath'	261
West Bengal	668	World's richest nation	348	Zambia	357
Westerlies	132	World Trade	286	Zanzibar	349
Western Samoa	356	World wars	218, 418	Zarathushtra	263
West-Kohoutek		Wrestling	747	Zatopek, Emil	715
Ikemura (1975-B)	104			Zeliangs	649
Westside story	273			Zeliberg, Seymour	388
Wheeled cart	210			Zend Avesta	263
Wheeler, Prof. John	90			Zeno of Citium	26
Wheels & Axles Plant	549, 550			Zero growth rate	2
White dwarfs	87			Zeus, statue of	3
White, Edward H	109			Zhirkov, Toder	3
White, Peter	139			Zhou Ziyang	314
Whither continents?	117			Zia ul-Haq-Mohammed	339
Whitman, Walt	265			Zimbabwe	358
Who's who in India	701			Ziyad Barre Gen. Mohammed	345
Wild animals, domestication of	209			Zonal railways	54
Wilde, Oscar	268			Zoroastrianism	263
Willingdon, Lord	415			Zuari, the	679
				Zytostatics	198

■ In Chapter 132 'Who's who in India' please read V. N. Gadgil as Minister of State for Information and Broadcasting with independent charge. Also, S. Krishnakumar as Deputy Minister for Family Welfare. Delete the name of Arif Mohammed Khan from Ministers of State.

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